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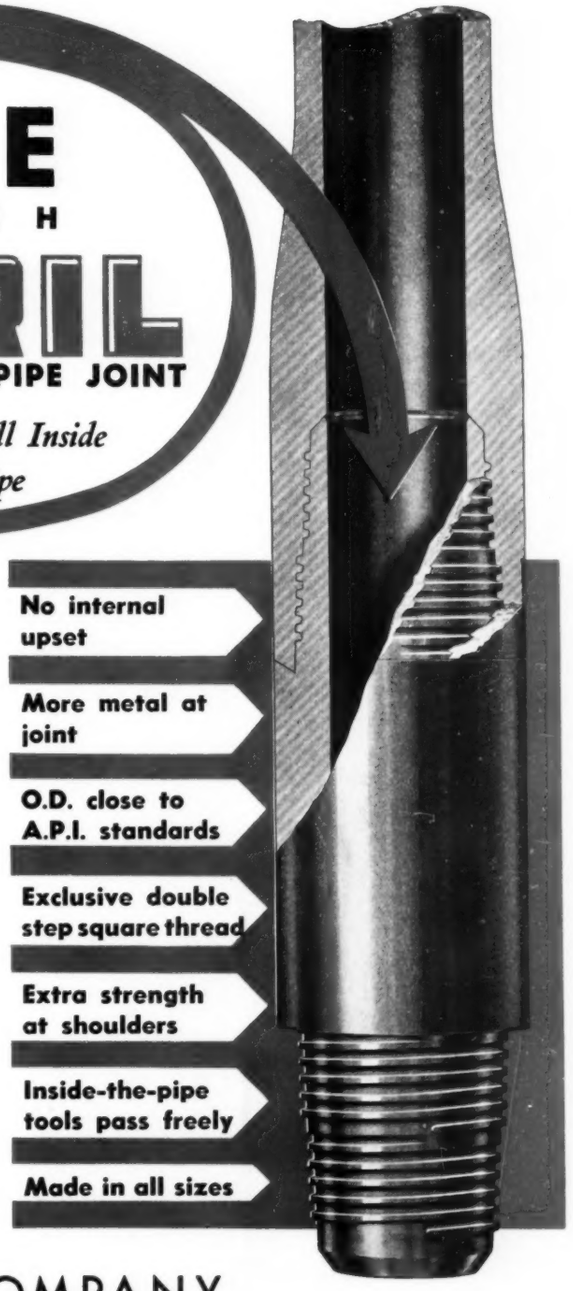
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THE OIL AND GAS JOURNAL

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OIL MAN'S CALENDAR

November

15-17—Pittsburgh, Pa., American Institute of Chemical Engineers.

22-23—Tulsa, fourth annual National Road Oil Congress.

December

4-5-6—Beaumont, Tex., Petroleum Electric Power Club.

4-5-6—Omaha, Neb., Nebraska Petroleum Marketers, Inc., Hotel Fontenelle.

7-8—Fort Worth, Tex., fifth annual meeting, Independent Petroleum Association of America.

19—Los Angeles, Calif., California Oil and Gas Association, annual banquet and Xmas Jinks, Biltmore Hotel.

January

8-10—Milwaukee, Wis., annual convention and Equipment Show of Wisconsin Petroleum Association, Parkinson Hotel.

14-18—Detroit, Mich., Society of Automotive Engineers, annual meeting, Book Cadillac Hotel.

17-18—Minneapolis, Minn., Northwest Petroleum Association, Minnesota division, West Hotel.

February

(?)—Columbus, Ohio, Ohio Petroleum Marketers Association, annual dinner, Deshler-Wallick Hotel.

7-8—Louisville, Ky., Kentucky Petroleum Marketers Association.

March

21-23—Wichita, Kans., American Association of Petroleum Geologists, annual meeting.

April

8-13—Houston, Tex., Oil Equipment and Engineering Exposition.

11-13—Dallas, Tex., Petroleum Industry Electrical Association, Baker Hotel.

22—New York, American Chemical Society, semiannual meeting.

(?)—Wichita, Kans., Kansas Oil Men's Association.

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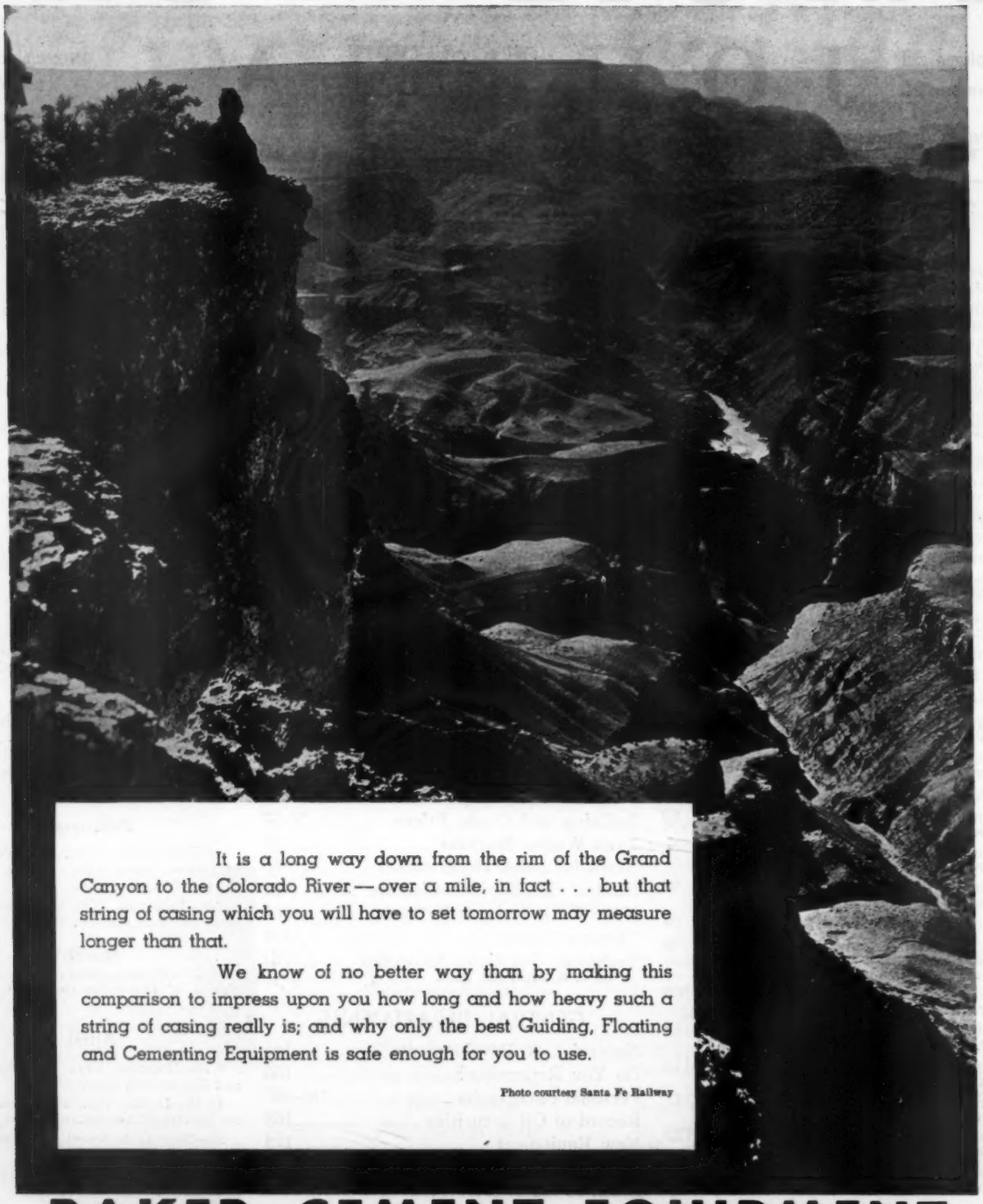

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Situation in East Texas Well in Hand and Better Feeling Prevails With Texas Output Down

By JAMES McINTYRE

WITH East Texas producing only 420,525 bbls. per day as an average for the week ending November 10, production in Texas was only 21,000 bbls. per day above the Federal allotment for that state.

A better feeling pervades the industry since the Federal forces in East Texas have succeeded in cutting down tank car shipments of oil to one-third and crude runs to East Texas refineries to about one-fourth of what they were when the field was producing hot oil in large volume. This cutting off of "hot" oil and "hot" oil products has strengthened both the crude and refined price structures.

The Fitts Pool in Southern Pontotoc County, Oklahoma, in which only 20 oil wells have been drilled thus far, saw the near completion of two more large producers in the past week. One of these produced for 5½ hours, a part of the time through tubing, and gauged 2,565 bbls. It was estimated to be good for from 13,000 to 15,000 bbls. per day. The other new well gave evidence of being able to pour out over 7,000 bbls. per day. As the wells in Fitts Pool are held down to an average of 100 bbls, per day in production the new ones were not permitted to flow more than a part of their potential initial production. The South Burbank Pool in Osage County came into the spot light with wells in the 2,500-bbl. class.

The Haury Burrton Pool in Reno County, Kansas, has a new 6,000-bbl. well and another new one which produced 5,481 bbls. in 24 hours, following an acid treatment.

Arkansas, which has lain quiet for a long time, astonished the production side of the industry with a well in the Rainbow Pool estimated as high as 15,000 bbls., but which had had no real test. It produced 5,000 bbls. a day through the drill stem. This pool which is in Union County, 10 miles northeast of El Dorado, is not expected to be large in area, and it may present unusual hazards to the investor in drilling operations.

A study of conditions in the oil region of California scouts the idea that the State's visible reserves of oil have been drained to the extent that California is heading toward a rationing period. Geological research indicates that the visible reserve of oil now is almost, if not quite, equal to the known reserves five years ago.

In Western Brazoria County, Texas, on a 4,000-acre block owned by one firm of operators, a well producing 68 gravity distillate was brought in. It flowed 550 bbls. a day through tubing and 5/16-inch choke, so it can safely be rated as a much larger potential producer. It is on what is believed to be a deeply seated salt dome of the nonpiercement type. The well is bottomed at 8,651 feet.

Crude Oil Production in the United States

Estimated daily average production for the week ending November 10, and a comparison with previous week and the Federal allowables follow:

	Nov. 10	Federal allowable in November	Nov. 3
Oklahoma—			
Oklahoma City	151,350	.....	108,950
Seminole-St. Louis	80,250	.....	69,025
Remainder of State	227,350	.....	222,475
Total Oklahoma	458,950	459,300	400,450
East Texas—			
Lathrop	167,265	.....	164,223
Kilgore	129,760	.....	127,823
Joiner	123,520	.....	122,724
Total East Texas	420,525	.....	414,770
West Texas	142,565	.....	140,774
North Central Texas	83,750	.....	84,510
Texas Panhandle	63,028	.....	62,023
East Central Texas	43,515	.....	42,973
Gulf Coast—Texas	164,220	.....	163,421
Southwest Texas	61,052	.....	60,053
Total State of Texas	978,675	957,300	968,527
Kansas	120,600	125,000	119,975
North Louisiana	23,830	.....	24,135
Gulf Coast—Louisiana	82,421	.....	81,473
Total Louisiana	106,251	90,000	105,608
Arkansas	30,190	30,000	30,235
Eastern Fields (except Michigan)	103,000	96,000	104,000
Michigan	26,421	29,000	26,736
Rocky Mountain area	96,160	91,700	94,190
California—			
Santa Fe Springs	39,500	.....	35,000
Long Beach	65,150	.....	51,250
Mountain View	10,100	.....	9,750
Elwood	8,300	.....	8,950
Kettleman Hills	54,150	.....	61,150
Remainder of State	312,300	.....	278,900
Total California	489,500	462,000	445,000
Total United States	2,409,747	2,340,300	2,294,721

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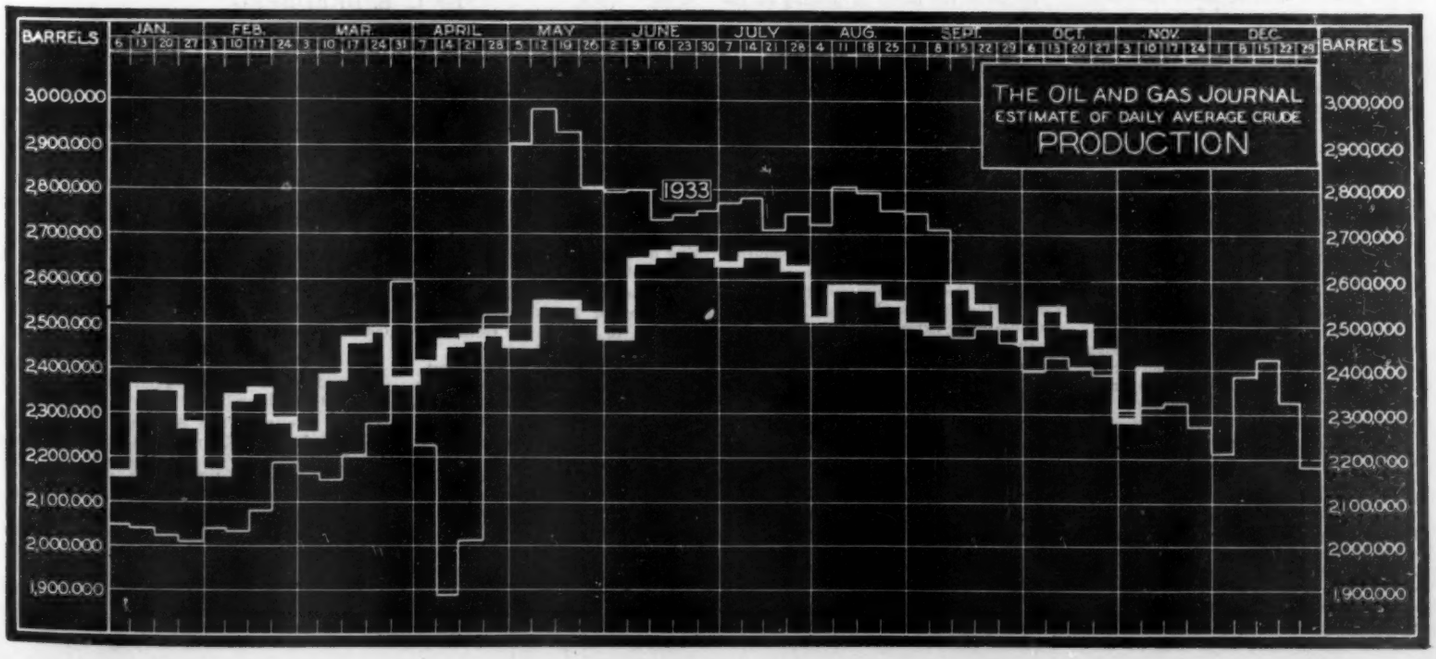


Gasoline Buying Program Delayed; Tender Board Is Halting Shipments; Employe Provision Is Still in Doubt

By HUGH D. MALLON
Washington Bureau, The Oil and Gas Journal

WASHINGTON, D. C., Nov. 12.—Resumption of gasoline buying under the auspices of the program committee has again been delayed until it is approved by the Department of Justice. Two hearings on amending and interpreting some of the labor provisions of the code were held, but no decision announced, while continued optimistic reports on the functioning of the Federal Tender Board in East Texas were announced here.

The program committee of the Planning and Coordination Committee has announced plans for the resumption of purchases of distress gasoline in the East Texas Field. Instructions have been issued to the committee's representatives at Tyler, Tex., setting up the conditions under which the gasoline will be purchased, and naming the refiners who are eligible to sell their products to the buying companies.

Practically all of the refining capacity of East Texas has agreed to go along in this program which is designed to raise the price of refined products to such a level that the operators will not find it necessary to resort to the use of illegally produced crude to stay in business. Provision is made in the contracts that the participating refiners shall not run through their refinery any "hot" oil.

Prices Vary With Crude Price

Purchases will be made on the basis of 5 cents per gallon, and will increase or decrease with the posted price of crude oil in that area. For every 5-cent rise in the posted price, the purchase price on the gasoline shall be raised one-fourth of a cent. A decrease of 5 cents in the posted price of crude will bring a reduction in the gasoline price of a quarter of a cent. In this manner, the committee is attempting to keep the necessary balance between the crude price and gasoline price.

The latest announcement forthcoming from the program committee was that every refiner except one in the East Texas area had signed the agreement with the program committee to abide by the terms of the purchase contracts. With this in mind, and believing that the one holdout might ultimately be forced into accepting the committee's terms, practically all of the companies which participated in the previous buying plans agreed to co-operate in this venture. One buying company was reported to be not ready to acquiesce in the desires of the committee, but it is believed this company has now capitulated.

The program committee had everything in readiness to proceed with the buying plan before it was officially announced it would go ahead. As a result the only thing necessary for it to do, once the refiners and the purchasing companies were in accord on the program, was to notify the various purchasing companies, and request that shipping instructions be sent to the proper office to take care of their respective gasoline quotas.

It has been estimated it will be necessary to purchase 700,000 gallons a month under this plan. During the last buying movement, the committee made arrangements for the purchase of well over 1,000,000 bbls. of gasoline per month.

Tender Board Reports Its Continued Success

The continued success of the operation of the Federal Tender Board was affirmed in an informal report of Norman L. Meyers, chairman of the board, to Administrator Ickes, in which attention was called to the sharp drop in tank car shipments since the board began working on October 25.

It was stated by Mr. Meyers that such shipments have fallen off about 75 per cent since October 25, compared with the preceding two weeks. The contention was advanced that "hot" oil operators have relied on the railroads to move their products into interstate commerce, but since the inception of this board the railroads have withdrawn their co-operation from these operations.

During the two weeks preceding the first meeting of the board it was pointed out in the report that 7,995 cars of refined products, including 3,015 cars of gasoline, had been moved, but in the succeeding two weeks, with the Federal Tender Board sitting and passing on the legality of all interstate shipments the railroads handled only 2,335 cars, of which only 582 were gasoline. Practically all of these cars were billed for intrastate shipment, in contrast with the two weeks before the board assumed office when almost all of the larger number of shipments were destined for interstate movement.

Checking Legality

To assist the board in passing on the legality of the oil for which certificates of clearance are asked, a special staff of examiners thoroughly familiar with the names, reputations and records of every operator in the East Texas Field, carefully checks each application before the matter is considered by the board. This work carried on at night, with the assistance of the members of the board, enables the board to consider the following day applications which have been received, and thereby, they are keeping current with the applications.

Besides the examiners, an accounting force is at work going over past figures bearing on the allowables and the production of the various shippers. This work provides an extremely valuable cross check on the determinations of whether the crude petroleum or its products is legal in each case.

The official figures covering the activities of the board from its appointment up to November 10 show that tenders covering approximately 13,500,000 bbls. of crude or its products have been issued. A total of 365 tenders have been granted, and no applications have been definitely rejected, but a number have been held up to permit additional inquiry by the board members. All applicants are required to prove to the board's satisfaction that either oil or refined products which they desire to ship has been legally produced.

Some operators, suspected of being refiners or producers of "hot" oil have been granted tenders on products which they proved to be legally produced or refined, but some doubtful stocks, legality of which could not be definitely proved have been sealed in the storage tanks on the recommendation of the Tender Board to the Texas Railroad Commission.

Definition of Employe Is Being Considered

Hearings were held during the week by the Petroleum Labor Policy Board to consider the definition of "employe" as set up in the code, particularly as such term affects operators of filling stations leased from the supplying company, and to consider whether marketing operations in communities with a population of 2,500 or less should be exempted from the labor and wage provisions of the code. No answer has yet been given to either of these points by the policy board.

Louis Titus, chairman of the legal subcommittee of the Planning and Coordination Committee, represented the Planning and Coordination Committee at both hearings, and was in charge of the industry's presentation. During both hearings it was freely charged and admitted by the Labor Policy Board that enforcement of the code provisions relating to marketing and labor had been entirely lacking.

In fact it was brought out by Paul Hadlick, who appeared in behalf of several Midwestern marketers associations, and also as the representative of the marketing subcommittee of the Planning and Coordination Committee, that the Petroleum Administrative Board, presented with evidence of a clear-cut violation of the existing definition of the term "employe," had declined to take any action on the matter because it was positive the case would be dismissed when it got into court. This took place before the appointment of the Petroleum Labor Policy Board, which now handles the labor provisions of the code.

The policy board was appointed on January 1, 1934, and it was brought out that this board had ruled, and had so stated in a letter which was introduced in evidence, that a station operator, running the filling station under a lease from the supplying company, was not an employe. The term "employe" as now in the code, and as it has been since September 23, 1933, clearly says that such an operator is an employe of the supplying company.

The Petroleum Administrative Board, and the Petroleum Labor Policy Board, both charged with the administration of the petroleum code, refuse to take any steps to enforce the code or to secure compliance with its provisions because they admittedly are fearful of the result when the question comes before the courts. Prior to the decisions by the two bodies several companies were voluntarily living up to this provision, although it was realized by all concerned they were not legally bound to abide by it. The statements of the two boards brought about the refusal by those companies to comply with that provision any longer, and it has been stated this action was the forerunner of more flagrant violations of the marketing sections of the code.

Proposed Interpretation

A proposed interpretation of Section 8 of Article 2 was presented to the board by Louis Titus, when the board stated that in its opinion any lease and sales contract was a violation of this section. His interpretation says:

"This section does not prevent an employe from voluntarily changing his status from that of an employe to that of an

(Continued on Page 134)

Still 35,000 Barrels of Hot Oil Daily; Drop in Refined Products Shipments

By L. E. BREDBERG

FORT WORTH, Tex., Nov. 12.—The Federal forces are keeping up the work started on October 25 when the Federal Tender Board held its first meeting at Kilgore, which has cut tank car movements of refined products from around 3,700 cars per week to less than 1,250 cars per week now. It has also been responsible for cutting runs to refineries from around 145,000 bbls. per day to a new "low" in runs to local plants, 45,900 bbls. per day, resulting in the shutting down of about half of the plants in the field.

Overproduction of crude has shrunk from around 125,000 and 135,000 bbls. per day to around an estimated 35,000 bbls.

Refined products shipped out of the field on November 8 amounted to only 188 cars, of which 63 were tendered and 125 were untendered. Thirty were shipped interstate, 21 coastwise and 137 intrastate. Probably many of the 137 cars shipped intrastate were of "hot" gasoline that has been in storage and cannot be moved interstate. On the following day only 173 cars were shipped, of which 113 were tendered and 60 were untendered. Sixteen were shipped coastwise, 130 intrastate and the remainder interstate.

Gasoline hauled from the field by trucks is to come under the new purchasing plan. F. H. Jordan of Dallas has been named co-ordinator between the truckers and refiners in the field and the major purchasers. He will have subdispatchers working under him at Waco, Fort Worth, Dallas and Houston. He will register all truckers hauling to major company stations and bulk plants who are members of the purchasing firm. An identification system requiring the signature of the trucker for recognition by any of the bulk stations, is to be used.

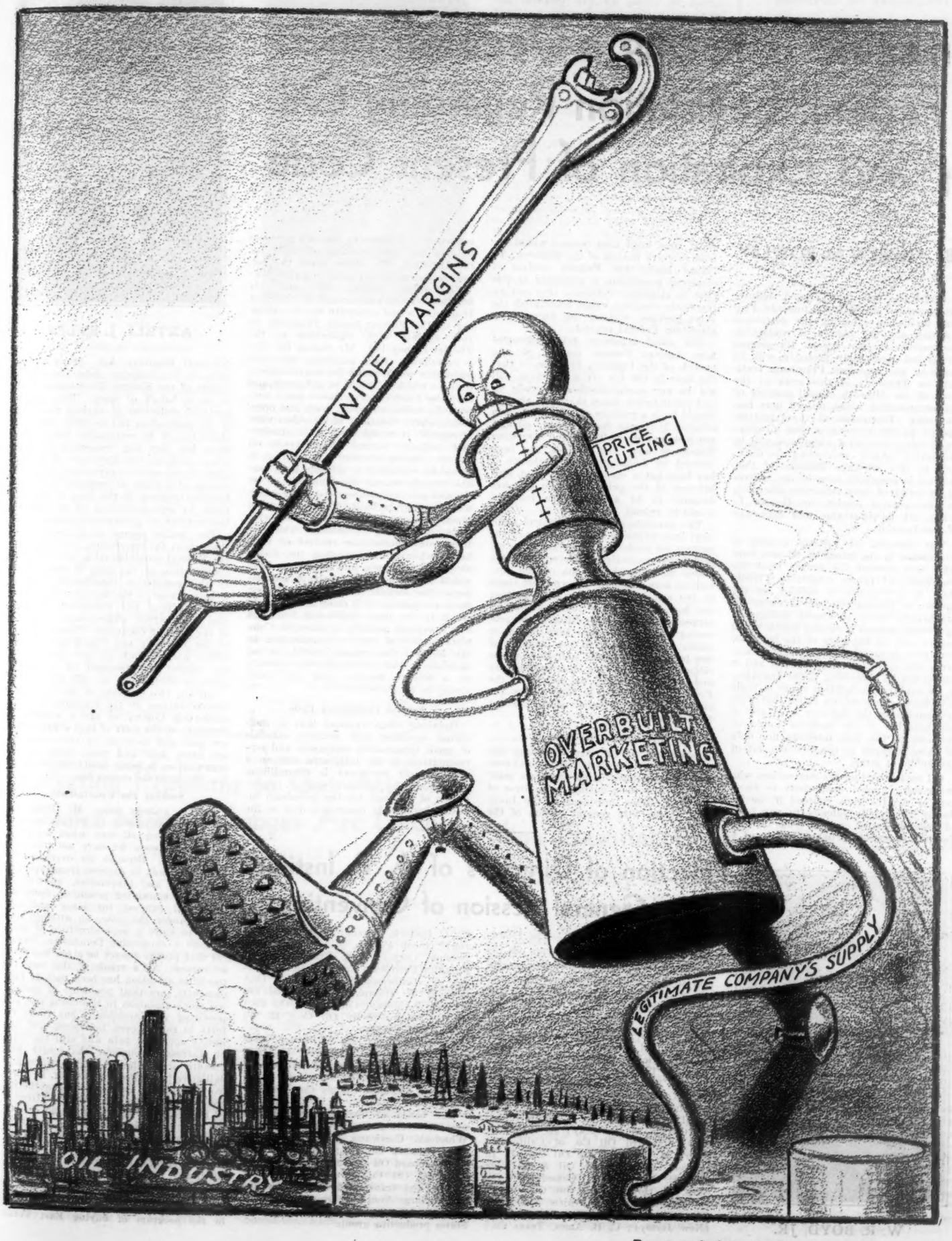
The refineries in the field are connected with only about 22,000 bbls. of legal oil, which is insufficient to supply their needs and keep their plants running. The requirements of the plants for November will run around 2,100,000 bbls., the major companies proposing to supply the difference at the regular posted price of $1 per barrel.

One pipe line company brought suit against the Railroad Commission seeking a tender for 33,000 bbls. of crude, but that suit has been indefinitely postponed by the District Court at Austin. If this "back allowable" oil had been granted a tender it would have thrown open the doors to applications for millions of barrels of such oil.

More suits were filed in the Gregg County Courts this week by the Attorney General's Department against violators

(Continued on Page 64)

Frankenstein Threatens



—Drawn exclusively for The Oil and Gas Journal

Institute Is Facing a Decision on Federal Legislation Regarding Oil and Expiration of Present Code

By ANDREW M. ROWLEY

DALLAS, Tex., Nov. 13.—A definite statement of its attitude towards Federal legislation affecting the petroleum industry and the matter of continuing the petroleum code beyond its present prescribed time limit probably will be made by the American Petroleum Institute on Thursday of this week at the close of the fifteenth annual meeting of the organization which opened here last Saturday. Discussion of these matters opened at the meeting of the directors on Monday, continued today and will be the major subject confronting the directors at this meeting. Because of this, interest is especially keen in the address to be delivered here tomorrow afternoon at the general session by Harold L. Ickes, oil administrator and Secretary of the Interior.

The question of Federal control is paramount in the minds of oil men here who have studied the matter from the standpoint of future conditions. While there is a diversity of opinion on the subject of Federal control of crude oil production, there is almost unanimous agreement against a control which would extend over all branches of the business. Sentiment is growing rapidly against any form whatever of Federal control and it would not be surprising if the Institute, in its expected declaration of its attitude this week, expressed its belief that Federal control of the industry or of any of the branches of the business would be inimical to the best interests not only of those engaged in the business but of the public at large.

Oil men attending the convention, who are making known their views to directors of the Institute, contend if the industry voluntarily submits to any form of Federal control, even of crude oil production, it would be but a matter of a short time until that control would extend to every branch of the business. To claims made that Federal control of crude oil production is necessary at this time to stabilize conditions, they say an interstate compact would accomplish the same purpose without the bureaucracy attending Federal control.

The chief argument being advanced here against Federal control of any branch of the business, however, is that the time is not far off when there will not be any overproduction of crude oil and the industry, when that time arrives, should be in a position to manage its own affairs. It is said that too many oil men are looking only at Today and forgetting Tomorrow and their outlook has been clouded by dollar crude even though it has been but a short time ago that they believed if the price of crude oil ever dropped to $1 a barrel the industry would be ruined.

The question of Federal control is of vital importance to the authorities of the various oil producing states and it is expected representatives of several of these states will attend sessions of the convention here and make known their views to the oil men. A dinner and meeting has been arranged for the governors or representatives of the different oil-producing states to be held here tomorrow night. It is pointed out the interests of the petroleum industry and the various oil-producing states are identical but that under Federal control the policies of the Federal body would be dictated by the large majority of states which are not oil producing.

President Byles' Speech

Sentiment of oil men attending the convention on the matter of Federal control was registered in no uncertain manner this afternoon during the address of Axtell J. Byles, president of the Institute, at the first general session of the convention. Expressing his own personal opinion and not speaking officially for the Institute, Mr. Byles made the following statement in regard to legislation:

"Reflection, during the past six months, on the experiences of the past 18 months, would constrain me, if a member of the Seventy-fourth Congress, to vote against such legislation as the Thomas-Disney bill. My reason for this is as follows: Even assuming that such legislation would stand the constitutional tests to which it would be subjected and that the Federal Government could successfully police all wells, pools and operations where violations of its orders were attempted, it would then be in absolute and exclusive control of the crude oil supply. Having attained this position, it would be compelled to allocate its allowable supply among the hundreds of refineries now in existence and those which would rapidly be built. This would mean practical control by the Federal Government of refining operations, which in turn would necessitate control of marketing operations, including the fixing of prices for crude and products. This would mean the end of private management—the socialization of the industry. Such a condition, if it came about, would result in the most inefficient and high cost operation possible to conceive. Complete control of crude oil production by the Federal Government would, in my opinion, be the end of the oil industry as a private business and the result would be as indicated."

Against Continuing Code

Opinions being expressed here by individual operators and refiners, officials of small independent companies and representatives of the integrated companies show clearly sentiment is crystallizing throughout the industry against continuation of the code for the petroleum industry beyond the expiration date of the National Recovery Act. Many smaller units in the industry claim the sole interests of the Federal Government seems to be in behalf of labor. They say reports of violations of various provisions of the code often fail to elicit action by those felt to be responsible for enforcement but that any complaint involving labor, such as the discharge of an employe or on matters pertaining to unionization of a plant or property brings immediate response in the form of personal visits by representatives of the Federal Government or government agency.

The feeling seems to be widespread throughout the convention, however, that the Federal administration will insist on continuation of the code in some form. In this connection considerable thought is being given to the matter with a view of simplifying and clarifying the code and eliminating objectionable features of the present document. Subcommittees of the Planning and Coordination Committee are at work on this matter and the subject has assumed an important place in discussions at this convention.

All but two or three of the industry's representatives on the Planning and Coordination Committee and a number of members of the staff of that organization are here and meetings of the committee are being held and other work of the organization is being conducted here during the institute convention.

Seeking the Unattainable

In his address today Mr. Byles expressed what seems to be the general opinion among oil men when he said: "Under the code we have not put first things first. Because an overbuilt industry, already in distress from excessive production and inventories, as well as from bad marketing practices, faced an additional expense for labor and materials under the code, an attempt was made to build a superstructure of price without a supporting foundation, forgetful that profits cannot be given but must be earned. As a result of this concept, too little attention has been paid to fundamental, practical problems of policy; too much attention to theorizing and improvising well-intentioned but futile efforts to relieve each individual and collective ache and pain and still the cries of distress throughout the length and breadth of the land. Each artifice and palliative has called for another. In other words, both the co-called code authority and the administrative authority attempted to attain the unattainable and enforce the unenforceable. Experience has indicated that reams of paper plasters in the form of and relating to orders, interpretations, modifications and rules had little, if any, healing effect."

Buying Plan's Legality

Considerable interest is manifested here in the program of buying East Texas

AXTELL J. BYLES

W. R. BOYD, JR.

Election of Directors of A. P. Institute at General Session of Convention

DALLAS, Tex., Nov. 13.—The following were re-elected as directors of the American Petroleum Institute at the general session of the convention this afternoon: R. A. Broomfield, Barnsdall Oil Co. of California; Oscar Sutro, Standard Oil Co. of California; L. P. St. Clair, Union Oil Co.; W. S. Farish, Standard Oil Co. (New Jersey); J. A. Vickers, Vickers Petroleum Co.; C. E. Olmsted, Texas Co.; Howard Bennette, Western Petroleum Refiners Association; Roy B. Jones, Panhandle Producing & Refining Co.; Frank B. Fretter, National Refining Co.; W. E. Smith, Standard Oil Co. of Kentucky; K. R. Kingsbury, Standard Oil Co. of California; Henry M. Dawes, Pure Oil Co.; L. L. Marcell, White Eagle Oil & Refining Co.; E. W. Sinclair, Consolidated Oil Corp.; J. Howard Pew, Sun Oil Co.; C. H. Kountz, Sinclair Prairie Pipe Line Co.; W. C. Teagle, Standard Oil Co. (New Jersey); C. B. Ames, Texas Co.; E. J. Bullock, Standard Oil Co. (Indiana); Jacob France, Mid-Continent Petroleum Corp.; Wirt Franklin, Wirt Franklin Petroleum Corp.; S. A. Guiberson, Jr., Guiberson Oil Investment Co.; William F. Humphrey, Associated Oil Co.; D. J. Moran, Continental Oil Co.; W. G. Skelly, Skelly Oil Co.; R. W. Stewart, of Chicago.

The following new directors were elected at the same time: W. V. Hartman, Gulf Refining Co.; A. A. Moody, Jarecki Manufacturing Co.; and J. A. Crawford, Republic Supply Co., Los Angeles, Calif.

The board of directors created four new directorships at large, electing R. L. Wheelock, Corsicana, Tex.; George A. Hill, Houston Oil Co.; John M. Lovejoy, Seaboard Oil Co., and W. S. Farish, Standard Oil Co. (New Jersey). Mr. Farish was transferred to the directorship at large from his former position as director representing the central United States production group.

gasoline which was expected to have been inaugurated yesterday. Doubt is expressed by some that the plan will accomplish desired results but the machinery was all set to start the buying program yesterday when it was learned the question of legality of the contracts had been submitted to the Department of Justice for an opinion. This resulted in a suspension of the buying program pending receipt of a decision from the Attorney General's Department regarding legality of the new contract forms.

Buyers of major companies had been ordered to proceed to East Texas on Sunday but these instructions were countermanded and the buyers, for the most part, are attending the convention, waiting further word in the matter. There is some feeling the delay in starting the buying program might have an unfavorable effect among East Texas refiners although many believe the delay will strengthen the program if the Department of Justice approves the contracts. It is pointed out that the refiners who had not joined the purchase program probably will do so if the Department of Justice renders an opinion favorable to the plan. The decision is expected here within a day or so.

Oil Exchange Committee

At the meeting of the board of directors of the Institute yesterday, Richard Airey, president of the Asiatic Petroleum Corp., presented a request for an expression from the Institute as to the attitude of its members towards the organization of a petroleum exchange. The directors considered the matter and authorized President Byles to appoint a committee to make recommendations. Sentiment among the directors appears to be against formation of an oil exchange dealing in crude oil. There is some feeling that an exchange dealing in gasoline could be operated successfully although the matter of Federal allocations and enforcement of "hot" oil regulations and rules covering shipments of gasoline made from this crude would be an important factor.

The committee selected to determine the attitude of the Institute and the petroleum industry towards the establishment of an oil exchange consists of Richard Airey, chairman; O. D. Donnell, Ohio Oil Co.; L. P. St. Clair, Union Oil Co.; J. Edgar Pew, Sun Oil Co., and W. H. Ferguson, Continental Oil Co. This committee will make its report to the board of directors tomorrow.

LACEY WALKER

The board of directors today reappointed all members of the American Petroleum Industries Committee. The board also adopted a resolution urging the development of an essential national and state highway program financed at reasonable costs by taxes levied upon highway users at reasonable rates, and recommended that consideration be given the development of low cost rural roads to make city markets available to farmers throughout the year. The resolution further urged that taxation of gasoline be made an exclusive function of the states; that gasoline taxes be lieved at reasonable and collectible rates; and that Federal, county and municipal gasoline taxes be eliminated. The resolution held further that all income from special additional taxes paid by highway users to finance highways be used exclusively for highway purposes without diversion, and pledged support of the industry in enforcing state gasoline tax laws and in collecting revenues in full.

To Re-elect Officers

It appears to be a foregone conclusion the directors tomorrow will re-elect Mr. Byles as president to serve another year beginning January 1. He is held in especially high regard by every branch of the industry and his policy of facing problems squarely and stating his views fearlessly has made a distinct hit with oil men. William R. Boyd, Jr., will be re-elected vice president and Lacey Walker as secretary according to all present indications. K. R. Kingsbury, president of the Standard Oil Co. of California and vice president at large of the Institute, is the only one being spoken of for this position during the next year.

Los Angeles in 1935

The board of directors today selected Los Angeles, Calif., for the annual convention next year. The date will be decided later. Considerable sentiment has developed favoring making Chicago the permanent meeting place where accommodations can be provided to house the entire convention under one roof.

Largest Meeting

The convention here is the largest ever held by the Institute. The previous record of registrations was at the meeting held in Chicago in 1930 when 2,198 persons registered at the official registration booths. It is predicted the final registration will show 2,500 in attendance. And, it must be remembered, all attending the convention do not register. At 2 o'clock yesterday afternoon 1,080 oil men had registered as compared to 787 at the same time at the meeting in Chicago last year. Between then and 6 o'clock 409 more men had signed registration slips and the big crowd only began to come in today.

Capt. J. F. Lucey, chairman, and members of the Dallas committee in charge of arrangements for the convention spared neither expense nor effort to make this an outstanding meeting. They had a bridge constructed across Commerce Street between the Baker and Adolphus Hotels, chief centers for the convention, at a cost of about $2,500, to eliminate the necessity of crossing a congested thoroughfare. How the bridge is appreciated may be visualized by the fact an official check of those crossing it Monday morning, before the convention really opened, showed that 900 oil men were using the bridge every hour at that time.

Committee Sessions

Matters of especial interest to producers and refiners are being considered at this convention. Meetings of the numerous committees dealing with special subjects relating to every branch of the industry started here last Saturday and continued Sunday and are scheduled for morning, afternoon and night sessions every day of the convention which closes Thursday. The group sessions of the divisions of production, refining and marketing start tomorrow and prepared papers on a variety of subjects of interest to each division will be delivered and discussions carried on at these sessions which are morning, afternoon and night. Two banquets will mark the close of the convention Thursday night, one being held in the Baker and the other in the Adolphus Hotel. On Friday everyone has been invited to attend a monster barbecue being given by Bill Boyd at his farm near Teague, Tex.

Production Problems

Of especial interest to production men is consideration being given at meetings here to the question of allocation of production. An effort is being made to get a proper allocation of production between tracts in a given pool. Standardization committees are covering many subjects. One committee is considering the matter of standardization of welded storage tanks. Standards have been adopted for riveted storage tanks. The committee also is ratifying specifications which have been adopted on flat belting.

Uniform Accounting

The directors on Monday adopted a resolution accepting the report of the committee on uniform methods of oil accounting recommending a uniform method of valuing petroleum inventories called the "last in, first out" system. It is felt adoption of this system will help in assuring uniformity in keeping books and accounts of those engaged in the industry.

"HOT" OIL PRODUCER CRAMPED BY FEDERALS?

DALLAS, Tex., Nov. 13. — Oil men attending the A.P.I. convention here who are somewhat skeptical as to the ultimate result of Federal activities in East Texas are getting a big kick from the following conversation which actually took place in Tyler, Tex., last Saturday. An operator, long considered a leading "hot" oil producer, was asked how he and the Federal agents were getting along. He replied: "Oh! Those Federal boys are cramping my style. Why they have got 16 of my wells cut down to an eight-inch choke." [Note: "Eight" not "eighth."]

Marketing Problems to Get Attention; Dealer Margin Changes Are Likely

By W. T. ZIEGENHAIN

DALLAS, Tex., Nov. 13.—Coming together at a time when the average net price of gasoline at filling stations throughout the United States is lower than at any moment in 1934 and is within 1 cent of the all-time low, those who are attending the A.P.I. convention here this week are training their attentions upon the marketing meetings. The suggestion came from Axtell J. Byles, president of the Institute to "place marketing problems in the foreground so that they may receive the full attention of those in attendance."

This same thought was expressed by Fred M. Lege, Jr., vice president of the Magnolia Petroleum Co. and chairman of the marketing group in Texas under the P. and C. Committee, favoring a revision in the method of marketing gasoline through dealers, for the betterment of both the integrated company and the dealer and he opened that portion of his discussion by saying "I take the position that a sliding, differential scale, or a fixed per cent of discount, on the sale of any merchandise is sound. This, in my opinion, applies to stable prices as well as fluctuating prices."

In the open discussion which followed it was apparent that the general plan of placing the dealer in the position where he must share the gains and losses of the retail market was favored and more than likely would be expanded into a general program. It was pointed out that within the State of Texas where it is now being tried, oil marketing conditions are worse than are found in most other states. The ease with which East Texas gasoline may be trucked or shipped by rail to all points within the State without having to pass through the tender board makes the problem of marketing within the State a broad one.

Summarizing the principal factors discussed it appears as though dealers may expect to receive lower margins on which to operate over the future; that the plan of having the dealer share gains and losses in the retail market as prices change will probably spread throughout the middle western states and that other steps will be taken by the industry as a whole, to discourage the expansion of uneconomic marketing facilities.

Nine Gasoline Grades, Higher Sulphur Tolerance, Is Suggested by Refiners

By W. T. ZIEGENHAIN

DALLAS, Tex., Nov. 13.—Nine grades of gasoline and a higher tolerance for sulphur in motor fuel were suggested by refinery representatives at the convention of the American Petroleum Institute as the principal changes to be incorporated by the Federal Specifications Board in a revision of its existing requirements. After considerable discussion, Doctor Bridgeman, of the Bureau of Standards, assured the refiners present that in view of the apparently successful use of motor fuels containing more than one-tenth per cent sulphur as specified in ordinary government motor fuel that he invites them to present data to him for review by the technical committee as a basis for that committee making a recommendation for a change.

California refiners have been especially anxious to see the sulphur specifications advanced and the desire has been apparent among many of the Mid-Continent and Gulf Coast refiners also, particularly since the higher octane gasolines have come into vogue. The Government has held a deaf ear to these suggestions in the past but has been forced to recognize certain facts at the moment, one of which is the successful marketing and use of motor fuels containing three and four times the allowed amount of sulphur. This is a common practice throughout the West Coast.

The suggested division of motor fuels into nine grades instead of four will allow for a more accurate gauging of seasonal and geographic needs by establishing a definite range of vapor pressure specifications for each grade. Whether such a system is adopted or some other idea is adopted, it was apparent that recognition of separate seasonal and geographic needs is desirable if the most good is to come from the motor fuel offered for use in the modern sensitive automobile engine.

Apparently friction between the De-

(Continued on Page 64)

Ickes Warns Institute Oil Industry Must Correct Situation to Escape the Heavy Hand of Government

By HAROLD L. ICKES
Administrator of the Petroleum Industry and Secretary of the Interior*

HAROLD L. ICKES

What of the future of oil? This question is more important both to the industry and to the country than it has ever been before—so important, in fact, that it behooves all of us, laying aside prejudices and waiving preconceived notions, to give to it our most earnest consideration. Unless we can look at the matter objectively, we would be wasting our time talking about it. The occasion calls for calm reflection, for a disregard of selfish interest, for a patriotic concern for the welfare of the country. I ask every man of you to forget for a brief interval that he has any personal interest in oil. Let us, as thoughtful American citizens, discuss this matter of vital concern to our country for upon its happy solution depends the future happiness, the well-being and perhaps even the safety of our America.

This is not the occasion to recount the waste and extravagance that has attended the exploitation of this valuable natural resource up to the present time. You know of this waste and so do I, although I doubt whether the country knows of it except in the vaguest possible way. The reason I do not believe that the people as a general thing understand the profligacy with which oil has been produced is because I am convinced that if they had known it, they would have stopped it long ago. They would have stopped it even if someone had been hurt in the process. And just as surely as I stand here they will stop it unless the industry forestalls the necessity for such action by itself doing what it should have done years ago. In these times the people are in no mood to be trifled with. Once let them get the picture, on the one hand, of millions of their fellow citizens being saved from the pangs of hunger only through the beneficence of the Government, and, on the other hand, of hundreds of millions of dollars being wasted through greed and unconcern and improvident management, and law makers in Congress and in the legislatures of the oil states will suddenly discover that after all there is a public interest to safeguard in this matter of oil.

As Friend of the Industry

I have come here today as the friend of the oil industry. I want to see it put its house in order and I want to help in that so desirable achievement if I can. With that end in view, I want to address myself to the enlightened self-interest of those engaged in the oil industry. I want to point out to you what you already know—that there is a distinct limit to our oil resources that can economically be made available even on the basis of the most generous and optimistic figures in which we can indulge our imaginations.

In a real sense oil is liquid gold, banked in the vaults of Mother Earth. What are we going to do with that liquid gold? It goes without saying that we ought to use it prudently. If it were gold actually lying in a bank, we would not think of drawing out $1,000 worth of it every morning and throwing it off the end of a long pier into the deep ocean. If we should attempt to do that, our next of kin would go into court, and properly so, and ask the court to appoint a conservator on the ground that we were incompetent to manage our own affairs. Yet this liquid gold that we call oil is being wasted on an even greater scale than would be the hypothetical gold to which I have referred by way of illustration. So in all seriousness I say to you that unless you yourselves stop this waste, the people of the United States one of these days will go into the court of public opinion and demand and receive a finding from that court that you are incompetent to manage this magnificent heritage. Then its management will be taken away from you for good and for all.

Something over a year ago, the Government, with the more or less willing acquiescence of the oil industry, set up the petroleum code. The theory underlying the code was that the industry, through a carefully selected committee, representative of all interests, with such help and co-operation as the Government could give through an oil administrator to be appointed by the President, should govern itself. This hopeful experiment seemed necessary because of the collapse that had occurred in the oil industry. There had been ruinous competition. Nor was ruinous competition the only disease from which the industry was suffering. State laws and local gentlemen's agreements had been openly flouted with the result that oil was being illegally produced, especially in the East Texas Field, largely in excess of market demand. So great was the burden of oil upon the market and so heavy the pressure resulting therefrom that the foundations of the industry had literally crumbled. The oil industry, part of it willingly, part of it with tongues in cheek, and part of it rebelliously, accepted government regulations of a sort as an alternative to utter ruin. So the code came into being.

Did Not Draft Code

You will recall that when the oil code was written it was not drafted by the Secretary of the Interior. When promulgated it did not contain certain provisions which he had thought desirable, while on the other hand it had language that he objected to. As a matter of fact the oil code was almost in complete form before I was even consulted. Even so I was not consulted enough to hurt. I was able to obtain only a few modifications of the original draft. When the code came to the Interior Department to be administered, it was not at all the code that I had wanted; it was not the code I believed we ought to have if there was to be a really successful administration. But I was a good soldier. I went ahead with what had been provided, defective though it was in my judgment.

At the outset I was strongly besieged by two groups with opposing opinions as to what ought to be done. Great pressure was brought to bear upon me to set minimum prices for oil and its products, such prices to vary according to local conditions and differences in costs. On the other hand, it was urged upon me that the solution of all our difficulties lay in the regulation and control of crude oil output. The decision was not an easy one for me to make. Neither course was free of difficulties. In the end I decided in favor of the second policy. I still think that my decision was sound. One reason why I turned away, at least for the time being, from price fixing, was because of the difficulty, I might say the almost insurmountable difficulty, of ascertaining what were those true costs which might serve as the basis for price fixing. To be sure figures were presented to me, but on close examination they did not stand up. To pore over books and records and accounts, to conduct independent investigations into cost items would require months, and time was of the essence. To control the supply of crude oil was a tough enough job, but as compared with price fixing it looked like an easy task. So upon the adventure of stopping the running of hot oil, the administrator embarked.

I think it will not be gainsaid that on the whole our allocations of crude oil production as between the various states have not only been fair from the point of view of consumptive demand, but equitable as between the states themselves. If there is any serious complaint on the score of our allocations, it has not come to my notice. Of course, we realized from the beginning that our difficulty would be an administrative one. Having made the allocations, how were we to restrict production to those allocations; how were we to prevent the running of hot oil? Obviously it would be impossible to police every one of the 300,000 wells that either was or might be an actual or potential outlet for excess oil. To begin with, I had no force of inspection adequate to watch all these wells. I had to build up from the beginning an inspecting force under Mr. Glavis. I was not properly staffed to prosecute the runners of hot oil even if we found them with the slime running from their fingers. I had to depend in the main upon the co-operation of the enforcing agencies of the various states, especially those of Oklahoma, California and Texas and I had to depend upon the co-operation, in good faith, of the members of the industry.

Lawless Minority

At this point I want to say to you, in all sincerity, that the majority of the oil industry was willing to co-operate with the Federal Government, in order to determine, by a fair trial, whether the problems of the industry could be solved by the plan we had adopted. But, as is often the case, despite the good will and laudable intentions of a considerable majority, a contemptible and lawless minority, with no respect for law or order and incapable even of ordinarily decent behavior, made it exceedingly difficult to carry out a worthwhile program set up for the benefit of an entire industry.

At the outset the outlaws referred to were a bit chary about playing fast and loose wtih the Federal Government. For a period they sought cover in order to devise methods by which they could continue their questionable operations. Gradually they became bolder. Soon they took up the crooked trail again and before long they were industriously at it once more, stealing their neighbors' oil and flouting regulations imposed by the Federal Government and concurred in by the great majority of their own industry.

Criticizes Compact

In an attempt to discredit the oil administration, this group set up a hue and cry that that administration was a failure. They persisted in this slander until some of the decent men in the oil industry even began to believe it. The purpose, of course, was so to discredit the oil administration, if possible, that there would be no sentiment for the extension or renewal of the oil code when it should expire by limitation of law. There developed in the oil industry a demand to do away with the oil administration. An effort was made to arouse a sentiment for "states' rights." It was suggested that the proper and best way to control the excesses that it was commonly admitted existed in the oil industry was by a compact between the states. Men who had been in favor of the principle of Federal regulation appeared as witnesses before the subcommittee of the Committee on Interstate and Foreign Commerce of the House of Representatives, that has been conducting an investigation into the oil situation, and testified, despite experience to the contrary in the very recent past, that all that was needed to put the oil industry on a firm basis was an agreement between the states, which would be enforced by the respective state authorities. They neglected to explain why similar attempts to accomplish the impossible had failed on previous occasions.

Defends Administration

I would be the last to assert that the administration of the petroleum code has been a success in every particular, but I do deny, and I shall endeavor to prove it, that it has been very far indeed from the dismal failure that certain of its false friends, and of course, its bitter enemies, have so loudly proclaimed. In discussing this subject, I shall speak with my accustomed frankness, but I want it understood that as to no individual will any of my remarks be personal, except only as to those who have been engaged in the crooked business of dealing in hot oil. To such persons I shall no more give quarter than I shall ask it. They are without the pale, so far as I am concerned. I will have no traffic with them, except before the bar of justice or of public opinion.

*Before A.P.I., Dallas, Tex.

I am no miracle worker. I have never pretended to be one. I am just an average government official trying with whatever capacity I may have to do as well as I know how a job that the President of the United States has given me to do. But even if I were a miracle worker, would it not be asking a good deal to expect me within the short life of the petroleum code to cure all of the ills and rectify all of the mistakes that had brought your industry to the verge of utter collapse in the early summer of 1933? You flatter me if you assume that I, or, in fact, any man, could perform so Herculean a task.

And now if I may, I am going to poke just a little fun at you. I shall not be ill-natured about it and I know that you will take it in good part. I hope that you have some sense of humor and that I, despite my many experiences in Washington, with the oil industry, among others, have retained a modicum of that same precious quality.

Amused at Attitude

Just between us and not for publication, isn't there something amusing in the situation in which we find ourselves? Here were men of outstanding ability, of great strength of character and of lifelong experience in the oil business—men who had made fortunes for themselves and others—coming to a public official who, until he went to Washington, knew nothing about the oil business, and had never had more than a general interest in it, and expecting him within a few months to accomplish what you, with all your experience, with all your wisdom, with all your strength of character, and with all your self-interest, had failed to do, although you had brought to bear your best efforts based upon years of intensive study of the problems involved.

I take it that the men here and elsewhere, who are interested in oil, constitute an almost unanimous body of opinion to the effect that the Government should keep out of private business. I have no doubt that, facing me in this audience today, are men who readily join in the general acclaim of business men generally in the United States that private industry no matter how badly managed, is better managed than it would be by Government. Again if I were not as polite as I really am, I might remark that if private initiative is so wonderful and so self-sufficient, how did it happen that the oil industry got into such a mess and why did it ever think of appealing to the Government for help?

Unreasonable Expectations

I think that any fair-minded man will agree that it was unreasonable to expect the Secretary of the Interior, within the brief span of 14 months, to repair the great ravages that had already resulted from the long-continued maladministration of the oil industry, and, practically single handed, forthwith put it upon a firm and enduring basis.

Let us be good sportsmen about this whole matter. I admit that I have not yet succeeded in doing all that I had hoped to do and what the industry, or at least some parts of it, wanted me to do, although perhaps doubting all along that I could do it. But after admitting that in one breath, I hasten to assert with the next that, when all is said and done, the oil industry has not had much to complain of with respect to the oil administration during these past 14 months. From a profitless business as a whole, when the oil administration took hold, you have been making fair profits. Many of you are using black ink when formerly you used red. Some of you have increased your dividends to your stockholders while others have gone from a nondividend to a dividend basis. If I am to give credit to what many stockholders say and write to me, I need not feel moved to join in the chorus, whether it be sincere or insincere, that the oil administration has been a failure. I happen to know that many individuals and institutions that depend largely upon the dividends they receive from oil stocks are strongly in favor of the oil administration.

The owners of oil royalties likewise have received, in the aggregate, an increased return. The value of royalty oil averaged $301,000 daily in the last quarter of 1933, during which the petroleum code was in operation, as compared with an average of $189,000 daily during the first nine months of 1933; $261,000 daily during 1932; and $204,000 daily during 1931.

Labor Policy

There has also been definite accomplishment so far as labor is concerned. According to the Bureau of Labor Statistics, for every 1,000 men employed in oil production in 1929, there were 827 employed in August, 1934, as compared with 608 in August, 1933, the month preceding the effective date of the petroleum code. For every $1,000 paid in oil field wages in 1929, there were $612 paid in August, 1934, as compared with $425 in August, 1933. There has been a reduction in average weekly hours worked and a gain in average hourly earnings. For refinery workers, too, there has been a reduction in average hours worked and an increase in average hourly earnings. Reports show, too, that there has been a marked increase in service station employment since a year ago.

All of you are familiar with the fact that the price of average Mid-Continent crude oil has been $1 a barrel for more than a year and that the steady market in this area has resulted in corresponding stability in other districts. If workers are to be employed under reasonable conditions and if they are to be paid a fair wage for their labor; if wells are to to be kept in proper repair; and if the premature abandonment of small wells is to be avoided, the price of crude oil must cover the cost of production of a reasonable portion of the output.

In most of the producing districts, the price of crude oil during the oil code period has been sufficient to cover the cost of production on more than three-fourths of the output.

Statistical Position

Compare the statistical position of the oil industry today with its standing last spring. Crude oil stocks began increasing last March and additions were recorded during April, May and June. By that time, the increases had created such a condition of oversupply that corrective measures were necessary. These were applied in July and in that and each succeeding month, crude oil stocks have been reduced. Current oil stocks at the moment are approximately 14,000,000 bbls. less than at the beginning of the code period.

Last winter, groups of oil men made frequent visits to Washington to direct our attention to the excessive stocks of gasoline. By March 24, according to the weekly figures of your Institute, there were more than 71,000,000 bbls. of finished and unfinished gasoline in storage in the United States. One month later the amended refinery section of the oil code was signed and the procedure established thereunder became effective June 1. The results obtained under that section of the code are remarkable. Gasoline stocks now are 20,000,000 bbls. less than the total of last March and are at levels which approximate closely the minimum working stocks which are necessary. In striking contrast to the situation last winter, the Board of Review of the Planning and Coordination Committee two weeks ago considered more than 40 appeals from refining companies, most of them well supported by facts, asking permission to manufacture additional gasoline this month in order that their inventory positions might be raised to reasonable levels.

Definite Improvement

If each of you will look back over the past year and, without prejudice or passion, compare present conditions with those of the summer of 1933, you will all find definite improvement in the industry as a whole.

I know it might be difficult for some of you to reach such a conclusion. The refiner who has had to buy his crude oil supply at posted prices and sell his products at the levels which have prevailed might be reluctant to admit that there has been any improvement. His lot has been the hardest of all. Most of these refiners have been extremely patient while waiting for the sun to shine. They may feel that they have been forgotten, but I can assure them that this is not so. Much that has been done during the past several months has had as its particular objective the strengthening of the position of the nonintegrated or the partially integrated refiner. The allocation of gasoline production quotas under the code and the program for the purchase of distress gasoline both had this as a common purpose. Each of these did its share of good, but the full measure of their accomplishment was not possible because of the "hot" gasoline from East Texas which kept moving into interstate commerce, and because of the price wars which raged in the territory east of the Rockies in the bitter struggle for gallonage.

I realize that East Texas has been an exceedingly popular dumping ground for complaints. It is the land of alibis. It undoubtedly has been blamed for many of the ills of the industry which have had their roots in other soil, but I feel very strongly that East Texas must carry a heavy share of blame for the conditions which weakened the wholesale gasoline market. How could it be otherwise when one of the principal news services of the industry has daily published the fact that gasoline, allegedly manufactured from "hot" crude, could be purchased at a price materially less than that made from legally produced crude?

Puts All Cards on Table

I came to Dallas with the clear intention of putting all of my cards on the table and here go some of them.

In some of the states there seems to have been a disposition on the part of the operators to produce in accordance with their own conception of consumer demand for petroleum products rather than to comply with the Federal allocations. The support that Oklahoma has given us has been, on the whole, reasonably satisfactory. At the outset there was in the fields of southern California a group of those men of whom I find it difficult to speak in polite terms, who openly and persistently flouted the orders of the oil administrator and continued to steal their neighbors' oil in cynical disregard of their duty as citizens of the United States to obey a mandate of the Federal Government, as well as of their obligation as men and neighbors to fellow owners of oil in the pools out of which they were taking more than their share. In course of time the situation in California came to be much improved. Patiently and persistently the right-minded members of the oil industry in that State, in co-operation with the oil administration, worked at the problem until an agreement was evolved which has reduced drastically the oversupply of crude to about 2 per cent. Even this is too much and I have been urging the Attorney General to bring appropriate suits to put a stop to this excess production.

Texas Stumbling Block

I refer now to the State of Texas, which has been our real stumbling block. In large measure, Texas was to blame for the plight in which the oil industry found itself prior to the promulgation of the petroleum code. And Texas has continued to be mainly responsible for the difficulties that have plagued the efforts of the industry, with the aid of the Federal Government, to pull itself together. Responsible as it has been for the conditions complained of, this State cannot be heard to criticise the supposed failures of the oil administration.

Some public officials and oil men in Texas have honestly tried to keep the production of crude oil down to the Federal allowable. Others have merely pretended to co-operate with us, while still a third group, more or less openly, has flouted all orders from Washington. Certain men have connived with and protected those who, in defiance of Federal regulations, have been wasting the substance of Texas. What their motive has been I will leave others to judge. I impugn no motives; I indulge in no characterizations; I merely state the facts.

Texas has always had it within its power to stop the production of illegal oil within its own borders. It is all very well to insist upon "states' rights," to demand that it be left to the sovereign state to regulate what it is claimed is purely an intrastate matter, but if a state insists upon the unrestricted exercise of what it claims to be its sovereignty, let it exercise it. I assure this State and all others that, so far as the Federal Government is concerned, subject only to its paramount right to prevent the waste of an irreplaceable natural resource, necessary to its welfare and indispensable as a means of national defense, it would be happy to be relieved of any responsibility with respect to the regulation and control of the oil industry of any state.

Duty of States

But it will not suffice merely to prevent the seepage of hot oil and its products into the channels of interstate commerce. No state will be doing its duty to itself or complying with its obligations to the Federal Government if it allows the production of a single barrel of hot oil even if that barrel is used within the producing state. Oil brought up in excess of the allowable is a constant pressure upon the market and a menace to the price structure even if it never leaves the state of its origin. This ought to be perfectly clear to anyone. Suppose for instance, that 125,000 bbls. of hot oil are produced every day in this State and are consumed here. That would release an equivalent 125,000 bbls. of legally produced oil a day, which, finding its way legitimately into the channels of interstate commerce, would constitute just as much of a weight upon the general market as if it were hot oil. As the situation stands here today, producers of hot oil, by paying a nominal fine, may sell that oil in Texas. They can pay the fine assessed and still make a very large profit. As was pointed out in an editorial in the Fort Worth Star-Telegram, the evening of November 3, the running of hot oil cannot be put an end to until the profit is taken from that disreputable enterprise. It is all very well to talk about complete co-operation between Texas and the Federal Government for the purpose of putting a heavy and permanent lid upon this hot oil business, but it will continue to be merely talk until Texas exercises the powers that it has and should exercise to stop entirely the production of hot oil for any purpose.

"Rotten Hot Oil Game"

Another matter. I wonder whether in this and other organizations of oil men there are members who are engaged in this rotten hot oil game. If there are, I respectfully submit that there is a duty to expel them. Just as a small percentage of hot oil will taint a storage tank; just as a little gasoline processed from hot oil will make illegal a whole tanker, so will membership in an association of oil men, of those engaged in the running of hot oil, be to the discredit of that association. Surely you owe it to yourselves to purge your ranks of this kind of gentry. How can it be expected that the Government or the country will receive, in full faith and credit, protestations of oil men in the matter of hot oil if they fraternize with those whose high-binding operations are so grievously hurting the oil industry? You would not expect the American Bankers' Association to receive professional bank robbers as members in good standing. You would think that jewelers were a queer lot if they associated on friendly and intimate terms with men who make their living by smashing plate glass windows and grabbing handfuls of gems. You believe that it is the duty of a bar association to expel from its membership a crooked

lawyer, and you take it for granted that medical societies will lose no time in showing the door to quack doctors. The same principles should control those in the oil industry. If you should refuse to associate with those who reek of hot oil, you would go far toward building up such a public opinion that these men could no longer withstand it. After all, they can hardly be blamed for thinking that you do not mean all that you say about them when you denounce their practices if you continue to receive them in a spirit of camaraderie.

To the People of Texas

And now I would have a word with the people of Texas, whether or not they are personally interested in oil. I address myself to them particularly because I am in Texas and because the practices under discussion are at their worst in this empire which calls itself a state. But what I am about to say could be said with equal force to the citizens of any other oil producing state.

Let us suppose that the potential oil reserves of the State of Texas are 1,000,000,000 bbls. of crude. Suppose that with the industry on such a basis as it should be, crude oil is worth $1 a barrel. That would mean present and prospective wealth of the State of Texas in oil of $1,000,000,000. Truly a goodly figure. Let us suppose that if this oil is marketed in an orderly and lawful manner, every barrel of it will in time bring $1 to the State of Texas. But suppose, on the other hand, that through failure of certain of your officials to enforce the law, the result is that a group of lawless men, through the illegal production of oil, forces the price to 50 cents a barrel. Your potential wealth in oil at once becomes $500,000,000 instead of $1,000,000,000. You have lost $500,000,000. Suppose the price goes to 10 cents a barrel, as it did in June of 1933. In that event, instead of this valuable asset of yours being worth $1,000,000,000, it is worth only $100,000,000, a loss of $900,000,000.

Losses to Texas

The loss, through overproduction, is the loss of the people of Texas. I wonder how long they will choose to remain blind to the real situation. I wonder when they will rise in their might and say to their officials: "You will stop this enormous and wicked dissipation of the wealth that belongs to Texas or we will find someone who will." Why should the people of Texas complacently permit such great riches to be destroyed? Let me remind them that a barrel of oil in a pool or in storage with a stabilized market is the same as a dollar in a savings account. It is there to be drawn out when it is needed. And if oil is worth $1 a barrel, you will want to get $1 a barrel for it. Why should you be satisfied with 10 cents, any more than you would be satisfied if the savings bank should give you 10 cents for the dollar you had deposited? It is your wealth that is being thrown away. It is you and your children who will have to pay in heavy taxes for the loss through wanton destruction of this natural resource with which Nature has so bountifully endowed this wonderful State.

In addition to the huge losses it has been suffering from the production of hot oil, Texas, and again the same is true of all other oil producing states, is forfeiting vast potential wealth as the result of wasteful and improvident methods of capturing oil. Let me illustrate. Suppose in a given pool there are actually 1,000,000 bbls. of oil, but that, as the result of wasteful and improvident methods of capture, only 300,000 bbls. of oil are actually taken from that pool. Assuming again that the price for oil is $1 per barrel, there would be a loss in this one pool of $700,000. With the same wasteful and improvident methods employed generally in taking oil out of all of your pools, you can estimate for yourselves the staggering losses that are being inflicted upon you. Therefore, I feel justified in suggesting to you that through the power of your might you not only put a quick and definite stop to the production of illegal oil, but that you insist, with equal force, that at every well brought into production there be put into effect at once the most scientific and up to date methods of taking oil out of the ground.

"Devilish Waste"

I had not expected to discuss at this time wasteful methods employed in the production of oil, but there has just been brought to my attention an example of such cruel and devilish waste that it almost staggers the imagination. There was brought to me in Washington, while I was working on this speech, a printed report entitled "Texas Panhandle Field, A Study of Gas Wastage and the Feasibility of Returning Waste Gas to Reservoir," which was prepared by an eminent committee of oil engineers whose names sponsor the report. I now quote from this report:

"From reports in the Pampa office of the Texas Railroad Commission, we find that for the month of June, 1934, gas was being blown into the open air from the Texas Panhandle Field in the approximate daily amount of 1,000,000,000 feet. The mere statement that 1,000,000,000 feet of gas is being wasted daily does not illustrate the significance of this great economic waste. It must be realized that the wastage is accumulative and continuous. The following comparisons tend to show what this wastage means:

"1. The State of Texas ranks first in the United States in the sale of natural gas. Yet if the gas blown into the open air from the Texas Panhandle Field could be converted into gas produced and sold from a state which now has no gas production at all; that state would surpass all other states in the Union and run Texas a close race for first place.

"2. If 62,634,000 bbls. of fuel oil were poured onto the ground, the waste of heat energy would be the same as the waste of 1,000,000,000 feet of gas per day for a period of one year.

"3. Further significance of the magnitude of this waste is illustrated by the fact that in one year it amounts to the equivalent in heat energy of 24,333,000 tons of Texas lignite coal. This amount of coal would fill 487,000 freight cars.

"4. The total electric power consumed in Texas during the year 1930 was 2,911,576,000 kilowatt hours (Texas Almanac). The amount of gas wasted in one year at the present rate is sufficient as a fuel to develop this enormous amount of electric current 6.4 times over.

"5. This amount of gas, on an annual basis, is sufficient as a fuel to gin 810,000,000 bales of cotton. Texas gins about 4,000,000 bales of cotton per year.

"6. It is sufficient as a fuel to produce 730,0000,000 tons of ice in a year. It is estimated that Texas produces about 6,000,000 tons of ice per year.

"7. If the present gas wastage in the Texas Panhandle Field were utilized as a fuel in a large electric generating plant there could be 2,575,000 horsepower per hour produced. This power would be 3.7 times the total power output of 700,000 horsepower per hour of the Grand Coulee dam and power plant which is being constructed by the U. S. Government in the Columbia River Basin of Washington State at a cost of $63,000,000. It would be 4.2 times the ultimate horsepower output of 612,000 horsepower per hour of the Wilson dam and power plant of the Muscle Shoals project in the Tennessee River Valley.

"In February, 1933, prior to the issuance of 'stripping permits' by the Texas Railroad Commission and likewise prior to the passage of the 'stripping law' (so-called sour-gas bill) by the Texas Legislature, the total gas blown to the air amounted to the then enormous figure of 300,0000,000 cubic feet of gas per day. Since February, 1933, this wastage has increased by rapid progression, having more than tripled in total volume by the month of June, 1934. Under the present set-up the 'sky is the limit' and there is nothing that will prevent this wastage from being tripled again and again."

I call this situation to the attention of the people of Texas in the confident expectation that they will see to it that such insane waste, as has been so graphically described in the report from which I have quoted, be ended promptly and effectively. People are hungry in Texas as a result of the depression through which we are passing; they are dependent upon the Federal Emergency Relief Administration to supply them with food and shelter. The Public Works Administration has poured many millions of dollars into this State to furnish employment in order to keep other people off of the relief rolls. It might well be asked whether the Federal Government is justified in spending all of this money in Texas so long as the State itself is allowing to escape into the air wealth which, if turned into money, could provide comfort and security for every citizen in this State now in want and, in addition, could enable it out of its own resources to support a magnificent program of public works.

There are other matters of immediate concern both to the oil industry and to the people that I wish to discuss briefly at this time.

Precarious Market Position

The oil industry today finds its entire market structure east of the Rocky Mountains in a precarious position. Where we do not now find price wars being bitterly waged, we have every reason to expect them momentarily to develop. The petroleum code has been blamed for this situation by those who seek to dissociate themselves from a responsibility that is distinctly theirs. Even those who are trying to "pass the buck" to the oil administration for this demoralization of the retail market know that the oil administration is in no degree responsible. The petroleum code, as is well known, contains no provision for margins for retailers. It does not even pretend to offer a solution of the problem of differentials. Accordingly, the problem of solving these marketing difficulties is one distinctly for the oil industry itself. It is a matter of concern for the petroleum administration, but not one of responsibility.

It is all very well for men in the oil industry to rebel at the thought of even moderate Federal regulation. They may wax ever so eloquent on the subject of the ability of American business men to run their own businesses more satisfactorily and more profitably than they could be run under Federal supervision. How often have we seen men become highly indignant as they discuss the waste and inefficiency of public management of business affairs. And yet I venture to remark that no government business at any time has been so wastefully and inefficiently conducted as is the oil business today. I refer particularly to the marketing phases of that business. Even if it should try to do so, I doubt whether Government could possibly put on such an exhibition of management, say, of the Post Office, as the oil industry is responsible for in the management of its marketing affairs. At least the Postmaster General does not aspire to build a post office on every corner and at every crossroad.

"Pigs Is Pigs"

You have all read, I hope, that delightful little skit, "Pigs is Pigs." If you have not read it, please do so, and then you will understand my paraphrase, "Filling stations is filling stations." Surely no one with eyes with which to see, will deny that there must be some kinship between guinea pigs and filling stations. One would think that the chief end and aim of the oil industry is to spawn service stations along the highways and the by-ways of this country. Here is private initiative with a vengeance, an initiative that is putting such a constantly increasing load upon the industry which, unless it is checked, will in the end break down the industry. I recommend to the oil industry that it put some curb on the reproduction of service stations. In your own interest as well as that of the public, you might well consider the advisability of operating this important branch of the industry on some other than the guinea pig theory. It might be well to establish a birth control clinic in an effort to control an output that has already put a severe strain on our whole economic system.

Come in Litters

Service stations are not being produced in this country merely singly or even by ways of twins or quadruplets. They come in litters. Nor is the competition confined to mere numbers. Our prudent and conservative business men, in deciding upon the type of filling stations that pockmark the roadside at a rate, which, if continued, will soon mean that no one on a road in any part of of the country will ever be out of sight of at least one filling station, have adopted that well-known American policy of "keeping up with the Joneses." If one man builds a modest filling station in a pure Colonial type of architecture, the filling station next door, or across the street, must be Georgian or English country home style. If "X" builds a miniature Moorish palace, his competitor will not be satisfied with anything short of something Romanesque. Gasoline may be bought for a song at dwarf Greek temples or abortive Gothic cathedrals. Why go to France to visit the famous chateaux country when one may visit that classical and soul-uplifting American institution, the "greasing palace"; or to Washington to stand in patriotic admiration contemplating the Washington monument or the National Capitol when perhaps right at home he may have a "lubrication emporium" to satisfy his aesthetic needs? At the rate filling stations are being built it might be well to adopt the necropolis type of architecture in anticipation of the day, shortly to come, when groups of filling stations will be in very truth cities of the dead.

While your architects are working on adaptations of Westminster Abbey or the Acropolis in order to cater to the discriminating and exacting tastes of aesthetic automobile owners who insist upon buying their gasoline only at those stations where, with each purchase of a gallon, they can get a spiritual uplift, you are reaching out in other directions and contriving by other means to extend your gallonage at the expense of your rivals.

Give Us Gallonage

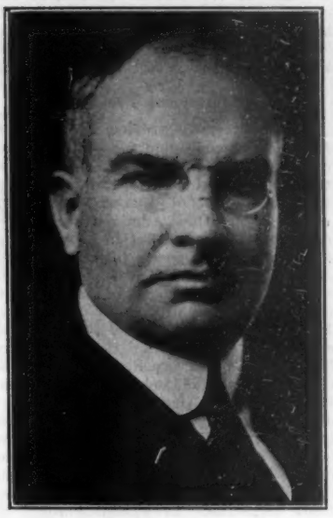
In accordance with the theory of "To hell with profits; give us gallonage," on which oil companies today seem to be conducting their marketing operations, bright-faced attendants, with a cheery greeting, jump onto the running boards of passing cars, chamois skin in hand, to polish the windshields. Free water, free air, free road maps are now matters of course. I have no doubt that in the race for gallonage, unless it be checked, gasoline will in course of time come to be free, leaving only lubricating oils from which to exact a reluctant profit. While in a prophetic mood, I do not find it difficult to envisage the day when the competition in giving away prizes, indulged in formerly by rival service stations, but now temporarily outlawed by the petroleum code, will again break out all the more virulently because of its temporary banning. Who will be so bold as to deny that it may come to pass that the tourist of the future will have to trade in his Chevrolet or his Plymouth for a huge truck in order to be able triumphantly to carry home the radios and kitchen stoves and baby grand pianos that he will be able to garner as premiums from competing filling stations as he tours the country?

Insane Scramble

If I seem to you to be jesting with a serious subject, let me hasten to assure you that the matter is no less serious with me than it ought to be with you. Such economic waste as is involved in the present insane scramble for gallonage, resulting in a plethora of distribution facilities and the prevalence of unsound marketing practices, is as truly abhorrent to me as it must be to anyone

(Continued on Page 64)

Chairman Beaty Discusses the Code and Permanent Federal Legislation



AMOS L. BEATY

By AMOS L. BEATY
Chairman, Planning and Coordination Committee*

My topic is "The Petroleum Code and Permanent Federal Legislation." What I really want to discuss is the second part of the subject. The first part, however, occupies logically the first position. In a sense it is preliminary. Moreover, it would seem appropriate that the industry at this time should have something in the nature of an account.

Any appraisal now should be in the light of conditions existing last year when the Recovery Act was passed, and when soon thereafter a code was formulated by this industry, and when still later our code was approved by the President. It is misleading to broadly contrast the last half of that year with the first, because we had partially risen from the depths before the code went into effect, and also because operations during the latter part of the year were under the influence of hopes too roseate. On the other hand, it would be unfair to charge all of our subsequent or more recent difficulties to the code and its administration, because underlying conditions in many respects have been far from ideal and quite beyond the reach of any code remedy.

We started 13½ months ago with no little enthusiasm. There was too much enthusiasm. In every such case severe reaction is to be expected. We have had that very thing, and at this time there are those who say the code is a failure. Others say it is worse than a failure, because it has operated in favor of one branch of the industry to the detriment of other branches.

All can agree that the code itself is not perfection. All should be able to agree, however, that it represents an honest group effort.

Beginning of Committee Work

The first meeting of the Planning and Coordination Committee was held on August 31, 1933, two days before the code went into effect. The President had indicated that he desired the advice of the Committee in regard to some proposed changes before the effective date. It was impossible, however, to reach conclusions and present them to the President and for him to act upon them earlier than September 13, on which date certain changes or modifications were made by the President.

Stop-Loss Pricing

Thereafter for some time the Committee devoted most of its attention to the compilation and study of data and the preparation of a minimum price schedule to stop sales below average costs as provided in the code. In this the Committee encountered the opposition of a portion of the industry, very substantial in volume of business and capital invested, and of members of the Administrator's Board. But on September 25, the Committee transmitted to the Administrator a schedule of minimum prices for crude oil and various products thereof, which schedule had been adopted in sections at previous meetings of the Committee. Following this there were numerous conferences between the Committee and the administrator or the board, in the course of which supporting data for the schedule was submitted. On October 16 the Administrator ordered that this schedule become effective on December 1, subject to such changes as might result from hearings to be held by the Board beginning October 30. The date for the beginning of these hearings was later postponed to November 20.

*Before A.P.I., Dallas, Tex.

A Substitute Proposed

Shortly prior to the last mentioned date the Committee was approached by the executives of major companies opposed to stop-loss pricing with a suggestion for further postponement of the hearings, coupled with a proffer to cooperate with the Committee in its other efforts, and a proposal that certain agreements be made in reference to marketing practices and the purchase of distress gasoline. On November 20 the Committee consented to a further postponement of the hearings for 15 days in order, if possible, to work out something in line with the proposal, and the administrator approved the postponement. During the 15 days ensuing, in the course of which many long conferences were held, two agreements were prepared, one the National Purchasing Agency Agreement and the other the National Marketing Agreement, both dated December 7. These were signed by practically all the larger units of the industry and by many of the smaller units, and they were submitted to the Administrator for his approval on December 8. On January 19, 1934, the Administrator entered orders approving these two agreements and at the same time entered other orders modifying them in several respects.

It became necessary, in view of the modifications, to bring the industry again into the conferences. These were held and finally resulted, on February 10, in the approval by the Committee of new forms of agreement in lieu of those dated December 7. The industry could not accept some of the modifications which the Administrator had made. It was felt that new conditions could not be imposed without the consent of the signers. The new forms of agreement bore date February 5, and were liberally signed, but the Marketing Agreement was never signed by a sufficient percentage to make it binding. Moreover, the Committee learned that the Department of Justice had interposed objections. Whatever objections were thus interposed were made to the Administrator and not to the Committee. But they finally proved conclusive, and thus the Committee's endeavor at stop-loss pricing, first diverted into attempted agreements, ultimately came to naught, except for the cue taken by the Pacific Coast refiners.

Pacific Coast Agreements

The Pacific Coast refused to be discouraged. As early as January 30, sensing that all was not well with the national agreements, these operators worked out a cartel for California, Oregon, Arizona, Nevada, Washington, Hawaii and Alaska; and when the Department of Justice objected to this cartel they proceeded to novate it. They entered into two new agreements for the same states, except that portion of Washington east of the Cascades, one known as the Pacific Coast Petroleum Agency Agreement and the other as the Refiners Agreement. These were approved by the Committee on May 25 and, after passing the Department of Justice, were approved by the Administrator on June 23, and are now in full force and vigor, with everyone apparently happy.

For the balance of the country the Committee on several occasions has renewed its recommendations for the establishment of minimum prices in one form or another, but the opposition has been too great, and on the last count of ayes and nays in the Committee on October 22 the nays had it, eleven to five. And thus the matter stands at present.

Principle of Emergency Price Fixing

On the question of stop-loss pricing, if I may be permitted to inject a few partisan words on this highly controversial subject, let me say that none of us favored valorization or permanent price fixing. It was considered only as a temporary expedient to go hand in hand with the purely artificial provisions made for labor and production control. The permissive provisions of the code and the course we pursued had in contemplation the establishment of minimum prices corresponding to average costs. I personally regarded the numerous artifices in the code and those which found their way into the attempted agreements, designed indirectly to bring about better prices, including improved margins for jobbers and dealers, as a process of whipping the devil around the stump. In my submission it would have been much easier to police and enforce direct minimum prices and margins. In either case control of production was an admitted prerequisite. The warnings against permanent government price fixing were not relevant, in my opinion.

I have referred at some length to this matter, because it was prominent in our code making and in the work of the Committee, as everyone in the industry knows. The complexion of the original committee and the well-known attitude of the President himself left no doubt that direct price stabilization was in mind.

But this does not mean that no other work has been done and that the Committee has been inactive as well as noiseless. We might point to the price of crude, which was established early in our deliberations at the joint suggestion of ourselves and the Administrator, and which has been maintained to date; but the deplorably low price of products prevailing the greater part of the time, with the incident losses sustained by non-integrated refiners serve to take away the satisfaction. Nevertheless, we were there and will doubtless be debited and credited.

Achievement of Economic Balance

Subordinate from the spectacular standpoint, though doubtless important from the permanent or long-term point of view, may be classed the continued drive to bring production and stocks into balance with demand, and in this the code has been most useful.

For several years there have existed twin economic evils in this industry following close upon the heels of the arch evil—overproduction. One of these twins is too much crude oil in storage and the other is excessive gasoline on hand, and the leaders of the industry have deplored the two. It is comforting to know that since the end of 1929 the industry has drawn from storage in the United States approximately 82,000,000 bbls. of crude. Of that quantity about 10,000,000 bbls. have been withdrawn this year to date. But better still is the record of performance in the matter of gasoline inventories. On March 31 of the current year the quantity of finished and unfinished gasoline on hand was 70,750,000 bbls., or about 7,650,000 bbls. more than was reasonably necessary in economic operation. Today the excess quantity is not more than 2,000,000 bbls., and that is isolated in California so that its injurious effects are not great. The nature of operations there is such that it is not practicable to immediately liquidate the excess stocks. The reductions of gasoline inventories thus accomplished must be credited to the present Article 4 of the code and to the agencies set up under that article as inserted by amendment on April 24 of this year.

Gasoline Allocations

There is no denying that the system of gasoline allocations and of appeals to the Board of Review has its defects, and there is no denying that hardships have been imposed upon some refiners, but results on the whole have been most gratifying and the long-sought-for economic level at last virtually has been reached. There remains the task of improving the system—and every new system in the very nature of things must permit of improvement, of avoiding inequities and hardships, and of bringing about more complete compliance. I think it is well understood by refiners that this system is largely voluntary; that it lacks the power of enforcement except through Section 7, which has never been invoked, and that the real force behind the thing is industry opinion. It is seldom that any reputable company will or can long operate in open defiance of the crystallized opinion of the industry.

I apprehend but little future trouble with gasoline inventories. For, in addition to Article 4 of the code, we have the fact, especially if crude oil production is kept in balance as it now is, that refiners cannot obtain the means to destroy themselves. In order to manufacture gasoline they must have crude oil. This they must obtain from current production or imports or withdrawals from storage. They will have a merry time obtaining too much in the way of imports, and the same is true of withdrawals from

storage. If for current production any company desires to take the premium-bidding or price-increasing route it will be received with open arms by producers who will hark back to the good old days.

Enforcement Problem

The enforcement problem has been difficult. The code, and especially Article 5 in regard to marketing, presented at the outset an almost impossible task for the Department of Justice. Our Committee and the Administrator were equipped with some authority to gather facts but had no power to bring actions, civil or criminal. That function rested solely in the Department of Justice. This is not said as a preface to criticism of Justice. Fairness demands that we take account of the fact that Justice carried the burden of proceeding under all the codes for all the industries under the Recovery Act. There were not enough district attorneys, not enough available lawyers in the United States, to have brought and diligently prosecuted actions for all code infractions. Through our Compliance and Enforcement Division 1,861 infractions have been brought to the attention of Justice and 444 prosecutions have been authorized. The cases have been forwarded by the Attorney General's office to the district attorneys in the various states with instructions to proceed. A somewhat less number of proceedings have been started and some of these have terminated one way and some another. Perhaps the break is about fifty-fifty. If it had been possible for Justice to quickly reach each and every infraction and deal with it swiftly at the very beginning much subsequent violation would have been prevented. Violation by one operator causes violations by his neighbors. These in turn breed other violations, and so on. It is like the breaking of a dam. When the water first begins to trickle over repair is possible. After the dam is half gone repair is hopeless. So, as I see it today, we are in a bad way to obtain legal enforcement of many provisions of the code, and there is no fairness in expecting compliance with these provisions by a few when they are openly violated by the majority.

East Texas

There is one brightening spot, however, and that lies in East Texas. Until recently it was a very dark spot. The dam was washed out and gone. But in East Texas the dam(n) illustration has proven faulty. The Government has shown that the arm of the law is still strong. And I believe that in future all its powers will be exerted against the unholy racket which it has been our humiliation to witness there for many months past. The voice of the law-abiding portion of the industry has been heard. Let it be raised as often as may be necessary. Let us not be deceived by the present retreat. We are not yet out of the woods. Enforcement of the Connally Amendment is not enough. We must be vigilant and present every case whether under the statute or under the code. If the offenders desire to become law abiding citizens and operate regularly they will be protected in their rights. Otherwise the fight will continue and they must eventually be subdued.

The larger integrated companies are now buying gasoline from East Texas refiners under a plan approved by our Committee and the Administrator which should assure them their proper place in the picture on a fair and honest basis. A part of this program is that the East Texas refiners will observe their quotas, and the major companies are expected to see that they obtain enough crude to supply their needs. The fairness of this arrangement can not be challenged, and it should serve the purpose of relieving the market of floods of cheap gasoline manufactured from illegally and therefore cheaply produced crude, concerning which there has been no end of complaint and alibis. With this arrangement working, and with Uncle Sam and the State of Texas seriously on the job, it will be the industry's turn to do something elsewhere at once.

Selling to Price Cutters

Which brings me to another point. Since the searchlight has been playing attention has again been focused upon the narrow and selfish, not to say idiotic, practice of some major companies of wholesaling gasoline to notorious price cutters. Such sales are actually made when the seller knows that the product will be retailed at subnormal prices in direct competition with the seller. Can one imagine anything worse or more stupid? Hardly. The number of companies engaging in this practice is not large. I wonder if preaching will do them any good. It is too bad that others have to suffer. Perhaps a remedy may yet be found. They came near being precluded by the February agreement. But for the moment they have escaped from themselves. More than once there has been recommended the creation of a single agency through which they would all sell their unbranded gasoline, this to be approved by Justice and the Administrator. It may still be worthy of their consideration.

Overbuilt Marketing Facilities

The marketing branch of the business can not be expected to enjoy much prosperity under existing conditions and no code or code authority can change the situation greatly. There are too many service stations and the service generally maintained is too extravagant. This fact is generally recognized. Companies insist upon maintaining magnificent stations and many of them. Due to long division of gallonage marketing costs have mounted. I dare say that the average cost of the companies from bulk station to automobile through company-owned stations is in the neighborhood of seven cents per gallon of gasoline. The companies can not hope to build up their gallonage and thus reduce their unit expense by continuing the present superservice. Competitors in the same category will not permit it. The public has become price-minded. It is satisfied with a 4-cent service. What is the answer? As I see it, each company pitched on the high scale must look out for itself and in some way reduce its marketing expense. This means a slow and gradual working back under economic pressure to a remunerative basis. It is apart from differentials or the competition of track-side operation or the selling of unbranded products. If those engaged in this type of sales have a lower marketing cost that fact must be recognized. It is best met by economics which will warrant the meeting of their prices.

Withdrawals From Storage

The administration of that portion of the code which deals with withdrawals of crude oil from storage has been successful, though little has been said about it, and the minimum of hardships has been imposed.

New Pools

Another effort that has proved successful is the planning of new pool development. Since the code went into effect plans for 300 so-called new pools have been submitted and approved under Section 7 of Article 3. Forty-six additional plans are pending. Fifty-nine of the so-called new pools had no production prior to the code. It is estimated that the 59 pools contain reserves of 600,000,000 bbls. The result is that by agreement these pools likely will be developed in an orderly manner. And, no matter what may be held in regard to constitutionality, practical benefits through the agreement route are obvious.

Marketing Rules

As to marketing rules, the debate is lively. Some point to the saving in equipment expense, others to the evolution in lease and agency agreements, and still others to the partial elimination of premium giving. It must be admitted, however, that due to lack of observance or enforcement these far-flung features of the code have not measured up to expectations.

Labor

Reference has been made to labor. Time does not permit much elaboration here. The industry is reasonably familiar with the story and is thoroughly conscious of the burdens it has assumed under minimum prices for labor. This price fixing was based, not upon replacement cost or anything of that sort, but upon the necessities of the case, and, so far as I know, there is no complaint, except in regard to certain features. On September 26 last the Administrator and the Committee issued a joint statement which correctly outlined our respective positions in regard to differentials for skilled labor and retroactive pay. The Administrator had the final say, and, although we were overruled, our position from beginning to end was made clear. On the code provisions relating to labor at stripper wells, and their definition, differences are still pending, but I am hopeful that, as a result of recent hearings, the Labor Policy Board will see the justice of our position. The industry knows what it is. In these matters the Labor Policy Board advises the Administrator. Finally in this connection I would presume to congratulate the industry upon its liberal treatment of labor and to pay special tribute to the major companies for the grace with which they have accepted this particular price fixing.

Regimentation

We hear a great deal about the regimentation of industry. Some of our statesmen spend sleepless nights. They bewail the trend towards bureaucracy. And no one objects to the warnings. They are constructive. But nothing is more absurd than the belief of some that we are hell-bent. The existence of such beliefs and fears is the best insurance against the event. I should like to see the color of the man's eyes who can regiment this country on a permanent basis. And what shall I say of the man or group of men or brain trust that would regiment the oil industry? Whoever thinks industry in this country is going to be regimented by government on a permanent basis is simply indulging himself in nonsense. This applies to industry generally. If the oil industry is to prove an exception to the rule it will be the fault of the oil industry. No sane government or administration would covet the task of regimenting this business. And incidentally, it is safe to say that no fallacious policy of the Government is going to end in utter ruin. Men are merely human beings, endowed with limited wisdom, and mistakes are inevitable, even in high places. But it usually transpires that errors are both repented and corrected. And statecraft is no exception to the rule. Moreover, when we swing we are prone to reach both extremes. Granted that we are slightly or theoretically regimented today, one can actually sense the beginning of a reverse movement, even before the job is half completed. Compose yourselves, you sentinels on the watch tower, this thing in the fog which you think you see is not a regiment, nor even a corporal's guard! The fog will lift, as it has lifted many times before, and out before your eyes will spread a peaceful land.

The pity is that our emergency regimentation — "mobilization" would have been a happier word—was not more complete. No necessity of mobilization in time of war was ever more urgent than was peace mobilization 18 months ago. And when you say it was not necessary in order to save the nation I think you are wrong. Happily, perhaps, it is natural to forget. And yet it is well to remember. None can forget, ever, the winter of 1932. Fortunes had been swept away, commodities were all but worthless, unemployment had reached an all-time peak, bread lines were lengthening, the banks of the country were soon to close their doors, and from somewhere came that which "sounded like the moaning of the wind before a tempest." Yes, it was high time to mobilize. And were there slackers? Some, but not many at first. In the face of dangers even more real than those faced in 1917 our industry, along with others, not only consented to be mobilized, but cheerfully formed its lines. There were conscientious objectors and slackers in 1917. The year 1933 saw rugged individualists and chiselers. It may not be proper to make this bracket, but the two alike make mobilization difficult. Moreover, no chiseler will admit he is one. He invariably claims to be a rugged individualist.

Whatever the couse, it must be admitted that mobilization of the oil industry under the petroleum code has been only partially successful. Those of us charged with responsibility have not slept on a bed of roses. We are engaged now in an effort to clarify and simplify the code. My personal hope is that as the country emerges from the conditions of the last few years our industry may be among the first to demobilize. It would be a great day if we could afford to disband tomorrow.

Government in Business

I want to say a few words about the oratory and bitter invective we hear nowadays against government in business, a theme close akin to regimentation. It is one that provokes the average business man to white heat. Government in business is, of course, both outrageous and crazy. In my opinion there are very few exceptions to this rule. I mean to say that Government should not allow itself to enter competition with its citizens.

But government is not in business when it only regulates. If in the general good it becomes necessary to make and enforce rules for the game of business this function is quite proper. That is not government in business; it is business under government; and this distinction is worth keeping in mind. As to how far government should go in regulating business, a safe rule is stated in the answer: No farther than is necessary to promote prosperity and do justice. In our industry the bugaboo that causes some to tremble and take foolish positions is clothed in the catch phrase "government in business." I wonder if the President or any single member of Congress would like to see the government go into the oil business. And I wonder if any of them would be unhappy if the government could be relieved of its responsibility to see that this part of our national commerce is conducted on a sane and decent basis. Here and there petty officials may be found grasping for power, but those who carry the responsibility and are conscious of it are not in the grasping mood. They are moved only by what they regard as clear proof of absolute necessity. True, mistakes are sometimes made in efforts to produce the remedy. Possibly remedies are prescribed when only nature has any healing power. But that does not alter the truth that in proper cases government must regulate business.

Effective Regulation

A few who should rank as leaders are exercised at the thought of any kind of legislation. Government regulation, however well directed, they would shun as the shade of the Upas. They see things at night and speak incoherently of creeping paralysis and the hand of death upon business. This is a bad sign—for them. It shows they do not know what has happened—to them. It is the same symptom that has developed frequently as the world has moved on. The railroads had it; the packers had it; the banks had it; the stock exchange had it. Our good friends hesitate to sit in council, to recognize facts as facts, and to devote their skill and knowledge to the task of devising workable remedies. They tremble and procrastinate until some crusader bent upon self-glorification brings them to bar. Then when the ordeal is over and they face a medley of complications and unnecessary restrictions they rail against the imperfection of laws. Vision would dictate that those who

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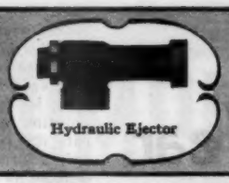
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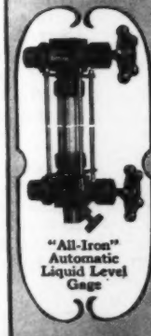
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Total Demand Last Quarter of Year Will Show Little, If Any, Increase

By C. O. WILLSON

The total demand for crude oil and refinery products the last quarter of this year will show little if any increase over the same period in 1933 if the reports of the Bureau of Mines covering September and August operations in the oil industry in United States are indicative of future trends. The September report reflects a condition first apparent in July and August during which the large increase in demand for most of the refinery products over the corresponding months last year was ended. The Government report for September in fact shows that the total demand for all refinery products was slightly less than in September, 1933, being the first time this year that this comparative situation has existed.

In general, developments as revealed by the bureau's latest report are in line with predictions of statisticians who warned refiners that the increases in demand the early part of the year ranging from 10 to 35 per cent in the principal refinery products, would not be maintained, with the further prediction that when the data for the last six months were added to the first six months the yearly total would not show any startling gains in consumption.

So far as shown in the government data, the lessened demand has not brought any disturbing increase in inventories due to the fact that refiners have reduced their crude runs to stills compared to the previous month of August and September last year. The less favorable situation from the standpoint of demand is explained in part as due to the fact that speculative buying, which was an important factor in the demand for some products earlier in the year, has ended in both foreign and domestic markets. There is the additional fact that demand started to improve the latter part of last year after a dull first six months and this naturally results in less favorable comparisons when the last half of 1934 is compared with the last half of 1933.

Market Significance

The market significance of the change in this comparative situation has been apparent for several weeks. A year ago certain sections were faced with a shortage of all fuels ranging from the heavy residuals to the light furnace oils and advancing prices reflected this favorable situation between supply and demand. Many refiners also were having difficulty in maintaining supplies of quality kerosene with a large gain in demand. The buying of lubricants improved almost overnight and with stocks limited these markets also advanced rapidly. Wax stocks were near the all-time low point and before the end of the year quotations advanced to the highest levels in several years.

The better prices stimulated production and, with the demand showing a tendency to decline rather than advance, supplies of all these products have been adequate over the past 90 days with no shortages reported anywhere. This situation is not interpreted as necessarily pointing to lower prices but does indicate that refiners do not have as favorable a situation in regard to supply and demand as they had a year ago. So far as gasoline is concerned, this market was unsettled a year ago and has been most of the time over the past year reflecting a similar situation in crude oil markets.

Refinery Products

The outstanding improvement shown in the export shipments of several products in August was not continued in September. There were gains in exports of kerosene and gas oil and fuel oil over September, 1933, but foreign shipments of gasoline and wax were less with a loss of about 50 per cent in shipments of lubricating oils.

In the domestic end, there was a seasonal decline in gasoline in September compared to August with only a 1 per cent gain compared with September, 1933. These September figures on gasoline have reduced the accumulative gains as shown in the accompanying table and for the first time this year the total demand for gasoline was less than 5 per cent over the corresponding period last year.

The gain in domestic demand has dropped to 6.4 per cent with a 14.3 per cent loss in exports.

Kerosene continues to show the most favorable comparative situation in regard to demand of any of the principal refinery products. However, the gain in total demand for the first nine months

(Continued on Page 134)

Crude Oil and Refinery Situation Summarized—First Nine Months of 1934-1933

Supply and Demand—Crude Oil (Bbls.)

	Total supply	Total demand	Excess Demand	Excess Pct.	Domestic production	Imports	Indicated‡ domestic demand	Exports	Stocks refinable crude Sept. 30
1934, first 9 months	710,481,000	716,918,000	6,437,000	0.9	685,096,000	25,385,000	686,184,000	30,734,000	348,937,000
1933, first 9 months	712,871,000	691,685,000	*21,186,000	*3.0	687,456,000	25,415,000	664,930,000	26,755,000	359,904,000
Increase, 1934	†2,390,000	25,233,000			†2,360,000	30,000	21,254,000	3,979,000	10,967,000
Increase, 1934	†.33%	3.6%			.34%	.01%	3.2%	14.9%	3.0%

Supply and Demand—Refinery Products—Motor Fuel (Bbls.)

	Total supply	Total demand	Excess Demand	Excess Pct.	Domestic production	Imports	Domestic demand	Exports	Stocks Sept. 30
1934, first 9 months	315,573,000	322,330,000	6,757,000	2.1	315,573,000		303,476,000	18,854,000	47,931,000
1933, first 9 months	306,523,000	307,092,000	569,000	.18	306,512,000	11,000	285,097,000	21,995,000	50,196,000
Increase, 1934	9,050,000	15,238,000			9,061,000	†11,000	18,379,000	†3,141,000	†2,265,000
Increase, 1934	2.9%	4.9%			2.9%		6.4%	†14.3%	†4.5%
Kerosene									
1934, first 9 months	39,188,000	38,250,000	*938,000	*2.4	39,188,000		30,884,000	7,366,000	7,495,000
1933, first 9 months	36,690,000	33,221,000	*3,469,000	*10.4	36,690,000		27,122,000	6,099,000	8,502,000
Increase, 1934	2,498,000	5,029,000			2,498,000		3,762,000	1,267,000	†1,007,000
Increase, 1934	6.8%	15.1%			6.8%		13.8%	20.8%	†11.8%
Gas Oil and Fuel Oil									
1934, first 9 months	247,271,000	261,993,000	14,722,000	5.9	244,429,000	2,842,000	241,050,000	20,943,000	120,518,000
1933, first 9 months	236,078,000	242,166,000	6,088,000	2.5	230,612,000	5,466,000	227,525,000	14,641,000	135,876,000
Increase, 1934	11,193,000	19,827,000			13,817,000	†2,624,000	13,525,000	6,302,000	†15,358,000
Increase, 1934	4.7%	8.2%			6%	†4.8%	5.9%	43%	†11.3%
Lubricating Oil									
1934, first 9 months	19,792,000	19,857,000	65,000	0.3	19,792,000		13,922,000	5,935,000	6,965,000
1933, first 9 months	17,073,000	18,589,000	1,516,000	8.1	17,073,000		12,472,000	6,117,000	7,179,000
Increase 1934	2,719,000	1,268,000			2,719,000		1,450,000	†182,000	†214,000
Increase, 1934	15.9%	6.8%			15.9%		11.6%	†0.3%	†2.9%
Petroleum Wax (Lbs.)									
1934, first 9 months	379,676,000	333,060,000	*46,616,000	*14.0	352,240,000	27,436,000	184,889,000	148,171,000	118,991,000
1933, first 9 months	358,920,000	443,563,000	84,643,000	23.5	336,840,000	22,080,000	254,567,000	188,996,000	80,636,000
Increase, 1934	20,756,000	†110,503,000			15,400,000	5,356,000	†69,678,000	†40,825,000	38,355,000
Increase, 1934	5.7%	†24 9%			4.5%	24.2%	†27.3%	†21.6%	47.5%

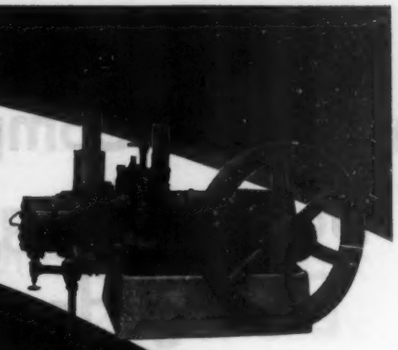
*Excess supply. †Decrease. Note—Total supply equals domestic production plus imports. Total demand equals domestic demand plus exports. Data on demand for refined products are based on refinery shipments. ‡Crude oil only.

Crude Oil Runs to Stills and Total All Oils (Bbls.)

	Total imports§	Total exports§	Total crude to stills	Nat. gasoline production	% Gasoline yield from crude oil‡	Total supply all oils*	Total demand all oils*	Stocks all oils Sept. 30
1934, first 9 months	36,542,000	85,725,000	668,563,000	26,531,000	46.14	749,420,000	764,466,000	587,167,000
1933, first 9 months	36,167,000	77,912,000	646,892,000	24,843,000	46.59	749,469,000	721,052,000	620,611,000
Increase, 1934	375,000	7,813,000	21,671,000	1,688,000		†49,000	43,414,000	33,444,000
Increase, 1934	1.0%	10%	3.3%	6.8%		†.006%	6.0%	5.4%

*Total all oils includes oil, refined products, natural gasoline and benzol. †Decrease. ‡Includes natural gasoline blended at refineries. §Includes crude oil and refinery products. All data based on Bureau of Mines reports. In case of gas oil and fuel oil and wax, imports include only products for domestic use.

This PUMPING ENGINE



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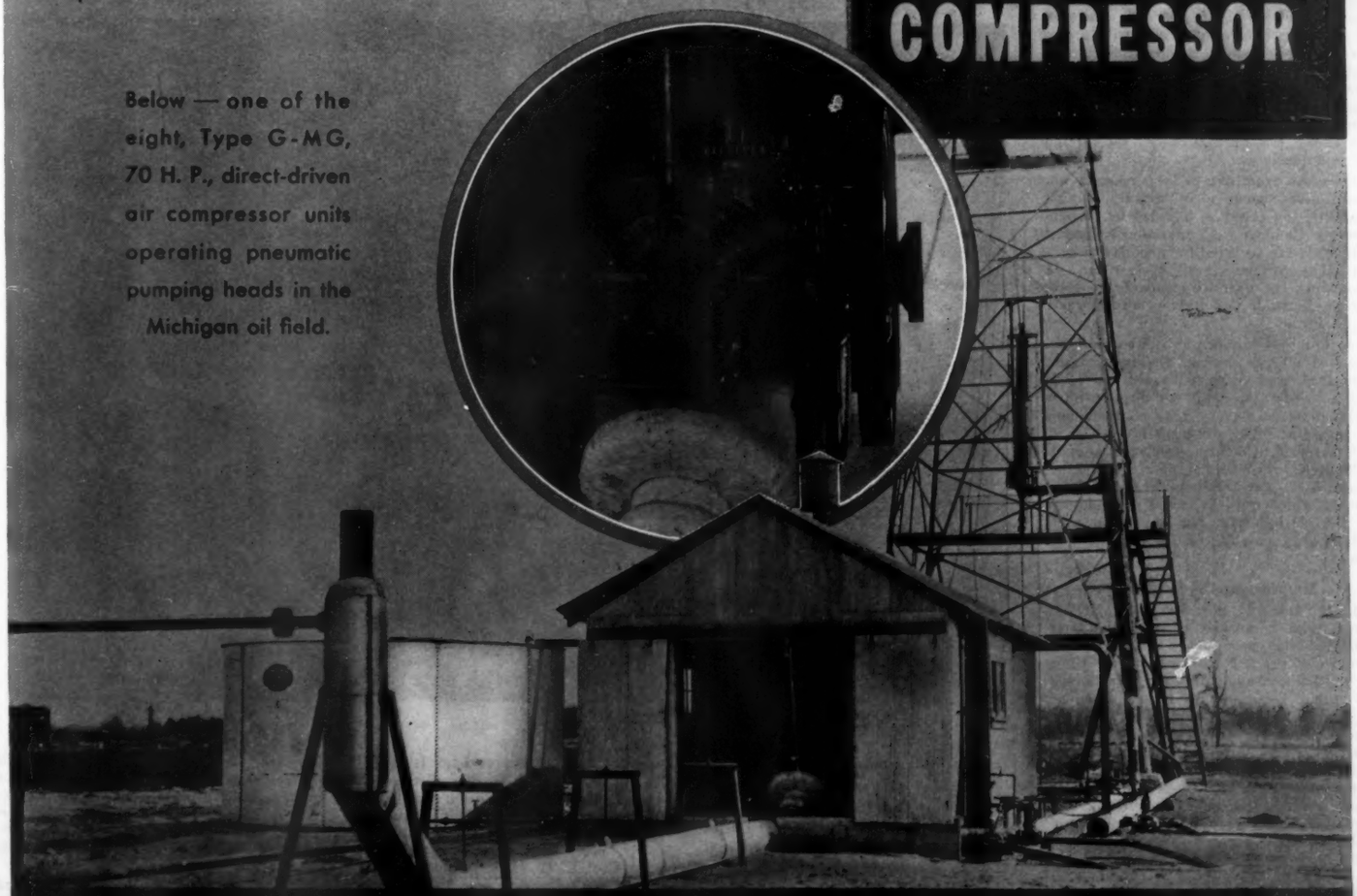

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Interstate Compact Recommended Before Congressional Committee During Hearings in Oklahoma City

OKLAHOMA CITY, Okla., Nov. 12.—Interstate compacts were recommended to the congressional subcommittee considering Federal oil legislation at the hearings opened here today. Chairman W. P. Cole, Jr., of Maryland, presided, accompanied by Representatives Carl Mapes, Michigan; C. A. Wolverton, New Jersey, and Edward A. Kelly of Illinois.

Wirt Franklin, president of the Independent Petroleum Association, recommended Federal legislation limiting imports to 4.51 per cent of the domestic production, allocation of production quotas with states retaining right to reallocate it to fields; limitation of withdrawals from storage in such amount as to work no hardships on domestic producers; planned orderly development of new fields, adequate penalties for violation of law, and creation of a Federal agency of either five or seven members, with Secretary of Interior as chairman to supervise enforcement of law. He also favored an oil states compact, with provision that such states accepting the compact be exempt from Federal law unless these states fail to enforce their agreements. He also favored continuance of the excise tax or high tariff on foreign oil and products.

On cross examination he personally opposed divorcement of pipe lines, saying the situation could be handled by the Interstate Commerce Commission's present authority. He declared for a policy of conservation rather than reservation or "hoarding" of natural resources; conservation, he said, was prevention of waste in all forms.

Arthur Seeligson, of Oklahoma City, asserted 90 per cent of the independent operators and royalty owners favored limited Federal control and that stripper wells must be saved from abandonment to insure stability of industry.

Senator T. P. Gore predicted a difficult path in writing a new oil law because of the age-old customs and laws of mining which were inherited and adopted by the oil industry. He would not commit himself on either Federal control or compact.

Mr. Marland's Testimony

E. W. Marland, governor-elect of Oklahoma, read a statement, which he later admitted was prepared when he was a member of the A.P.I. Committee of Eleven in 1925 and apologized for "giving you old stuff." He explained it was intended to show that conditions had not changed much and that predictions of an oil shortage were "just so much guessing." This report declared for "security in the ownership of oil lands and the right to lease," and the rights of competition and "the free operation of the law of supply and demand."

On cross examination he said he would go to Texas this week to confer with James V. Allred, governor-elect, to discuss an oil states compact. Until a compact is approved by the states and Congress he would carry on under Federal control "and see if we can work our way out." He opposed divorcement of pipe lines, asserting the Interstate Commerce Commission had failed to exercise its authority in regulation although the act was approved by President Roosevelt last May. Under the compact plan the Federal Government would be the umpire.

Alex W. McCoy, geologist and vice president of E. W. Marland, Inc., estimated reserves of oil in the United States at 11,000,000,000 bbls., of which 4,125,000,000 bbls. are in fields discovered prior to 1927, and the remainder in developed and undeveloped reserves. He showed that the U. S. Geological Survey estimate in 1925 was 5,000,000,000 bbls., but since that time the nation had produced 7,000,000,000 bbls. and still had 11,000,000,000 bbls. left. He said: "I have been making these estimates for 18 years and I do not think much of them."

C. C. Osborn, Tulsa economist and attorney, pointed out fallacies in estimates made by associations and experts since 1918 to show that each had undershot the mark and also presented a map showing possible reserves. His estimate on reserves was 13,000,000,000 bbls., of which amount 6,750,000,000 bbls. are in California. No estimates were given on other states.

Legislature May Act

Reford Bond, corporation commissioner, recommended exclusive control of allocations in the states, but a grant of authority to the Federal Government to determine state quotas. His other recommendations were the same as Mr. Franklin's, with the exception of the Federal board. He said the next legislature would be asked to amend the Oklahoma law to include well spacing and other production methods.

W. C. Irey, Bureau of Investigations of the Department of Interior, stationed in Oklahoma for three weeks, charged Oklahoma was running hot oil since adoption of the code, but later was forced to admit it was overproduction shown on commission's pipe line runs reports for seven months this year. He recommended giving full control of oil to Federal agencies.

Frank S. Craven, Tulsa, recommended a Federal supervisory board to handle all matters, and in each state boards to handle all branches of industry, including labor, with an advisory board, supported by a tax of one-tenth of a cent per barrel.

Jake Hamon of Ardmore and Tyler opposed Federal control and charged Administrator Ickes started work a year too late in East Texas; he admitted hot oil was about stopped there now.

Harold B. Fell, representing the National Stripper Well Association, pleaded for stability, supporting the same recommendations as Mr. Franklin.

Representative Pettengill was the only member of the committee absent, but he will join the committee in Dallas.

Representative Wolverton criticized the Mid-Continent Oil and Gas Association as having no program to present Tuesday when Clarel Mapes said the membership had been unable to agree on policy. Mr. Wolverton said he had been advised the American Petroleum Institute also had no plan.

Earl Oliver recommended a control board with responsibility shared by Federal and state governments and property owners, stressing need of change of law of capture and institution of unit development plans.

C. C. Brown, assistant umpire, presented reports to show overproduction in Oklahoma was but 2.2 per cent.

—Photo by Paul Stithem Studios.

On the invitation of Walter Ferguson, vice president of the National Bank of Tulsa, a party of Tulsa executives traveled to the A.P.I. meeting at Dallas, Tex., in the special car of President M. M. Cahill of the M.-K.-T. Railroad Sunday.

W. G. Skelly, president, Skelly Oil Co.; E. R. Filley, division manager, Texas Co.; Rush Greenslade, vice president, Gypsy Oil Co.; J. J. Larkin, director, National Bank of Tulsa; W. L. Connelly, chairman of board, Sinclair-Prairie Oil Co.

Second row: P. H. Bohart, assistant to the vice president, Gypsy Oil Co.; Burdette Blue, vice president, I. T. I. O. Co., Bartlesville; E. H. Chandler, general counsel, Sinclair Prairie Oil Co.; Ralph O. Dietler, vice president, Stanolind Crude Oil Purchasing Co.; Nelson K. Moody, president, Sinclair Prairie Marketing Co.; E. H. Moore, independent operator; J. C. Denton, vice president and general counsel, Mid-Continent Petroleum Corp.; Walter Ferguson.

Third row: P. C. Lauinger, president, The Oil and Gas Journal; C. L. McMahon, independent operator; J. B. Doolin, independent operator; George S. Rollin, vice president, Shell Petroleum Corp.; C. F. Camp, president, C. F. Camp Co.; E. L. De Golyer, independent operator, former president of Amerada Petroleum Corp.; Allmand M. Blow, vice president, Amerada Petroleum Corp.; A. E. Bradshaw, president, National Bank of Tulsa; Arthur Lawrence, independent operator; E. E. Kirkpatrick, Slick-Urshel interests.

E. I. Hanlon, chairman of the board of the National Bank of Tulsa, is kneeling in the foreground.

H. V. Foster, president of Indian Territory Illuminating Oil Co., Bartlesville; W. M. Bovaird, president, Bovaird Supply Co.; Dan Moran, president, Continental Oil Co. and C. H. Sweet, vice president, National Bank of Tulsa, were also in the party.

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NEWS FROM FOREIGN LANDS

IRAQ

The participation of the Gulf Oil Corp. in the Near East Development Co. which holds a 23¾ per cent interest in the Iraq Petroleum Co. Ltd. has been taken over by the Standard Oil Co. (New Jersey) and the Socony-Vacuum Oil Co. Inc., according to an ofifcial announcement of the past week. It had been previously reported that the Gulf stock amounting to a 20 per cent stock interest in the Near East Development Co. had been purchased by the Standard of New Jersey, the latter company having previously purchased the 20 per cent interests of the Atlantic Refining Co. and the Pan American Petroleum & Transport Co.

With the retirement of the Gulf corporation, ownership of the Near East Development Co. rests exclusively with the Standard of New Jersey and Socony-Vacuum with controlling stock interests in the hands of the former company. The Near East Development Co. represents the American interest in the Iraq Petroleum Co. Ltd., owners of a valuable oil concession in Iraq including a $50,000,000 pipe line project which was recently completed. Deliveries of oil are now being made at both the Tripoli and Haifa terminals of the pipe line.

GREAT BRITAIN

A substantial gain in refinery operations in Great Britain this year is shown in the latest available government figures covering imports. Practically all the crude refined at plants in the United Kingdom is imported so that the official data on imports are a reflection of actual refinery operations. Data for the first nine months of this year show that 376,859,000 Imperial gallons of crude oil were imported into the United Kingdom. This represents an increase of 82,974,000 Imperial gallons or approximately 28 per cent over the same period in 1933.

It is expected that figures for the last three months of 1934 will show additional gains. The Lobitos Oilfields, Ltd., last month started operating its new refinery at Ellesmere Port on the Manchester Ship Canal. This plant has a crude oil capacity of 3,500 bbls. daily and is now operating on a regular schedule. The plant consists of a topping unit with a vacuum distillation unit for the manufacture of lubricating oils. Its products will be distributed on a wholesale basis in the United Kingdom.

The increase in refinery operations in the United Kingdom is largely taking care of the increased demand for motor fuel in those countries, although the great bulk of the fuel consumed is still imported. The imports of motor spirits for the first nine months of this year totaled 847,149,000 Imperial gallons, which was approximately the same as the 848,618,000-gallon total for the same period in 1933.

Imports of other products for the first nine months of 1934 and 1933 are as follows (data in Imperial gallons):

	1934	1933
Kerosene	155,758,000	129,155,000
Lubricating oil	80,569,000	76,491,000
Gas oil	101,986,000	84,824,000
Fuel oil	472,709,000	407,815,000
Other oils	16,073,000	11,705,000

Total imports of crude oil and refinery for the first nine months were 2,051,103 gallons.

The largest monthly increase of the year in imports of crude oil and petroleum products in the United Kingdom was shown in August, according to official reports. The imports for the month totaled 250,398,000 Imperial gallons, a gain of 54,461,000 Imperial gallons, or 27.7 per cent when compared with August, 1933. This increase compares with previous monthly reports which indicated a gain of around 10 per cent in imports.

Due to the large gain in August, the accumulative figures for the first eight months of 1934 show a gain of 207,370,000 gallons, or 12.5 per cent over the same period in 1933. The following report shows the imports for the eight-month periods of 1934 and 1933 (data in Imperial gallons):

	1934	1933
Crude oil	334,108,000	265,119,009
Gasoline	765,892,000	750,398,000
Kerosene	142,882,000	117,437,000
Lubricating oil	74,305,000	64,114,000
Gas oil	95,256,000	76,824,000
Fuel oil	416,433,000	361,319,000
Other oils	14,543,000	10,837,000
Total	1,843,418,000	1,636,048,000

The principal sources of these imports were as follows:

GASOLINE

Dutch West Indies	328,415,000	275,405,000
Persia	155,300,000	151,201,000
United States	87,258,000	128,047,000
Mexico	37,298,000	31,397,000

CRUDE OIL

Persia	162,581,000	142,537,000
Dutch West Indies	12,971,000	4,149,000
Venezuela	3,060,000	12,689,000

KEROSENE

United States	46,660,000	32,549,000
Persia	36,650,000	31,885,000
Rumania	37,131,000	27,550,000

Importation figures in the United Kingdom are generally considered an accurate gauge of consumption for the reason that the domestic production of crude petroleum and other raw materials used in manufacture of finished products are of minor importance in relation to the total consumption. Based on the figures to date the increase in consumption this year will be the largest ever recorded.

The importation data show a substantial increase in crude oil imports. Several refiners have increased the capacities of their plants and are buying more crude in foreign fields. The gain in gasoline imports was relatively small with a large increase in kerosene demand.

In regard to sources of supply for the imports the Dutch West Indies have shown a large increase this year in the case of gasoline while imports from the United States have declined. Kerosene imports, however, increased more than 30 per cent from the United States.

The new refinery of the Lobitos Oilfields, Lt., located at Ellesmere Port on Manchester Ship Channel, England, is now scheduled to start regular operations the latter part of the month. The Lobitos company for several years has had production in Peru and the new plant will operate with crude oil from that country. The refinery is expected to handle 100,000 tons yearly or approximately 2,000 bbls. daily. It is the only new refinery to be built in England this year.

FRANCE

Imports of crude oil into France increased 66 per cent the first seven months of this year, according to official figures. The crude imports for that period totaled 2,293,771 tons which compares with 1,375,355 tons for the same period in 1933. Based on barrels, the crude imported would indicate that French refineries during that period averaged 75,000 bbls. daily to their crude stills not including the small domestic production which also is refined in France.

Due to the large increase in imports it is no longer necessary to import as large quantities of finished products. This is shown in the following report giving the imports for the first seven months of 1934 and 1933 (data in tons):

	1934	1933
Kerosene	25,585	54,050
Gasoline	662,762	1,035,841
Lubricating oil	99,263	112,560
Gas oil	165,382	214,216
Fuel oil	188,519	375,526
Road oil	28,612	51,733
Total*	3,487,521	3,235,054

*Includes crude oil imports.

RUMANIA

Crude oil production in Rumania established a new record for the year in September with a total for the month of 720,000 tons. This exceeds the daily average of August and July. The principal producers in September were as follows (data in tons):

Astra Romana	155,600
Steaua Romana	101,000
Concordia	98,900
Phoenix	79,300
Romana-Americana	78,600
Prahova	53,900
Creditul Minier	38,500
Colombia	37,200

Drilling well in the Vallezza-Monterotondo field near Fornovo Taro, Italy

MEXICO

Mexican crude oil production totaled 3,434,516 bbls. in August with a value of 11,771,113 pesos. This is the largest monthly production and the greatest value of the year. Mexican production, which is running about 20 per cent ahead of last year, totaled 24,434,401 bbls. for the first eight months of this year with a total value of 81,215,283 pesos.

The following production and export taxes apply to Mexican crude oil and refinery products for October (values calculated in silver at exchange of 3.00):

VALUES

	Silver pesos per cubic meter	U.S. currency
Fuel oil	30.57	$1.35 bbl.
Gasoline	88.97	.0935 gal.
Kerosene	51.31	.0540 gal.

PRODUCTION TAXES

	Tax per c.m.-pesos	Tax in U.S. currency
Crude (sp. gr. 0.93— Be. 20.38	3.702	$0.16349 bbl.
Crude (sp. gr. 0.96— Be. 15.68) or heavier	2.265	.10003 bbl.
Fuel oil (sp. gr. 0.95— Be. 17.21)	3.485	.15390 bbl.
Gasoline (crude)	3.559	.00374 gal.
Gasoline (refined)	1.779	.00187 gal.
Kerosene (crude)	3.079	.00324 gal.
Kerosene (refined)	1.539	.00162 gal.

The production tax on fuel oil will vary approximately .01262 per barrel for each degree of specific gravity above (deduct) or below (add) 0.95 specific gravity.

The production tax on light crude will vary approximately .01341 per barrel for each degree of specific gravity above (deduct) or below (add) 0.93 specific gravity.

EXPORT TAXES

Note: As export taxes are payable in silver at par, to make calculations in U.S. currency, take figures given below, multiply them by 2 and divide by rate of exchange at time of payment.

	U.S. currency ($1 for 2 pesos)
Crude (sp. gr. 0.93— Be. 20.38	$0.07949 bbl.
Crude (sp. gr. 0.96— Be. 15.68 or heavier)	.04928 bbl.
Fuel oil (sp. gr. 0.95— Be. 17.21)	.05962 bbl.
Gasoline (crude)	.00472 gal.
Gasoline (refined)	.00189 gal.
Kerosene (crude)	.00151 gal.
Kerosene (refined)	.00057 gal.

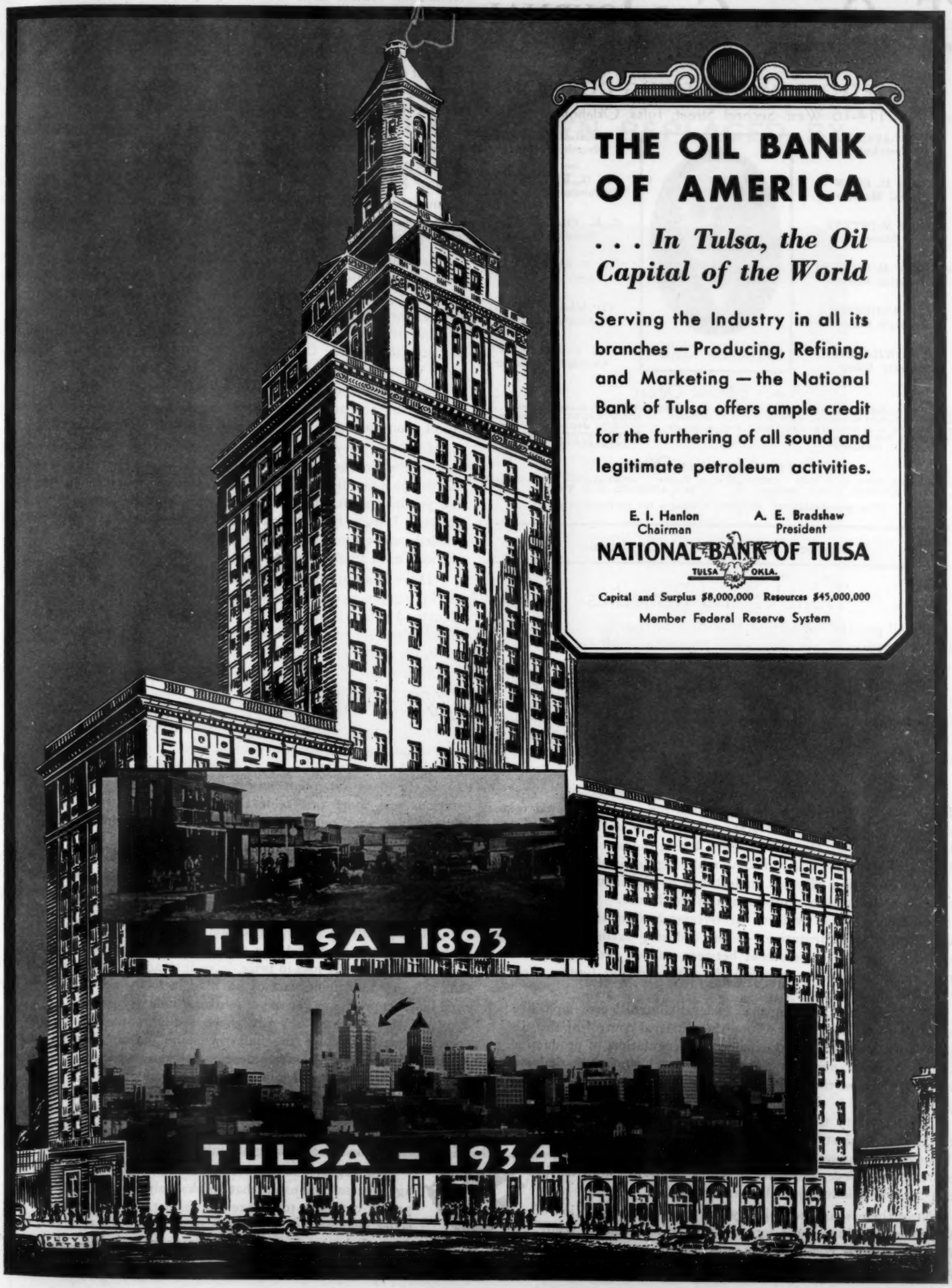
GERMANY

Imports of crude oil and refinery products in Germany of this year totaled 1,786,953 tons, a substantial gain over the 1,523,000 tons imported the first eight months of 1933. Crude oil imports of 205,600 tons were practically the same as last year. Gasoline imports for the eight-month period jumped from 643,200 tons last year to 757,200 tons this year. Gas oil imports were 383,700 tons this year compared to 264,700 tons last year. The gas oil is partially used in cracking operations at refineries.

Crude oil production in Germany is also increasing, totaling 27,338 tons in September and 30,423 tons in August. The bulk of the production is coming from the Hanigsen-Abershagen-Nienhagen district where the September production totaled 22,000 tons.

SOUTH AFRICA

The British Burmah Petroleum Co. and associated interests are reported to be making plans to build the first petroleum refinery in South Africa. The exact location of the plant has not been announced. The refinery will furnish petroleum products for distribution in British South Africa. It is understood that the Anglo-Transvaal Consolidated Investment Co., a British investment house will be associated with the Burmah interests in the project.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Troubles and Remedies

It will pay the industry to take time to read the speeches at the Dallas meeting of the American Petroleum Institute. They show what is wrong with the industry and suggest several remedies.

Overproduction of crude, of course, continues to be the basic trouble. The root of that has been the law of capture which compels haste in recovery, "a law made years ago by judicial decision based upon error in understanding on the part of the industry and the courts."

Obviously, if a law is based on false premises and its effects are clearly disastrous, something should be done about it. President Byles very properly says the states and the industry should take it up, even if amendments to state constitutions are required, adding forcefully that half the energy spent during the past 18 months under the code could have secured some real progress in this respect.

Unit operation of pools, undertaken by the industry, would then be a first check on overproduction in the future.

On the general problem of overproduction the tenor of the speeches by representatives of the industry favored an interstate compact, involving agreement between the oil producing states to restrict production in line with the total demand figures disclosed by the Federal statistics.

The dangers of drifting into Federal control were emphasized. It should now be clear to everyone that Federal control of the oil business must mean continual expansion of regulation, of production, refining and marketing in every detail until the whole industry is nationalized, and the oil industry as an industry is driven out of the picture.

In its anxiety to accept any regulation that would rid it of its troubles the industry has not looked far enough ahead. It has been dismayed to discover that Federal regulation is developing more and more toward Federal control of every operation until at the end the whole industry will be in a lockstep.

Nevertheless, as Judge Beaty warns, on the expiration of the code next June some form of regulation must be ready. A congressional committee is now hearing testimony preparatory to framing regulatory legislation. The industry should not confine itself to offering opinions to this committee. It should be doing something on its own account.

Mr. Boyd cited the reduction in gasoline inventories accomplished under the refinery program which he described as "not essentially Federal control but really Federal supervision of a permissive, co-operatively operated program of control which without the sanction of the recovery act would not be possible legally."

The opportunity is open for refiners to co-operate in a program of self-regulation if they will use it. The experience of the chairman of the Refinery Board of Review has convinced him that "it is not now or ever will be desirable for the refining industry to surrender permanently to the Federal government the control of its own business merely to get rid of troublesome competitors or to obtain relief from its own chiselers and its own passions."

Speaking of competition and chiselers leads directly to the problems of marketing and margins which took a large share of attention, particularly in the address of Secretary Ickes which was the feature of the meeting. The Oil Administrator was unsparing in his analysis of that situation and threw that responsibility right back upon the industry to correct. On this point the speakers before the Institute were vigorously in accord.

The overproduction of crude and gasoline which primarily plague the industry accentuate and aggravate the abuses in marketing which recoil upon the producer and refiner in demoralized markets.

Mr. Byles very appropriately pictured the overbuilt service station as the Frankenstein of the oil business. Yet it originated in a worthy purpose, the idea behind the first free pump being to protect the public against substitution and the seller against loss of retail outlets. Unhappily, it had a fundamental flaw. It invited and expanded competition, carrying in its wake other premiums and concessions until finally the monster dominated its creator.

"There is an uncomfortable similarity between some of our retail marketing practices and those of the old beer saloon where equipment and other perquisites were furnished free of charge by the brewer until saloons occupied three out of four of many of the corners in the country."

Observance of the rule in the code against giving or loaning equipment and other concessions and making the refiner responsible for the resale of his products at his posted prices would help greatly.

The practices which have created this Frankenstein have led to ever widening margins which in turn have multiplied stations and promoted price wars.

In the days of 2-cent margins the larger gallonage to fewer stations was more profitable than the 4-cent margin is today to the retailer with more competition and consequently smaller volume.

Mr. Byles probably truly predicts that "unless this fever is abated it will not be long before the average filling station will make less or lose more money on an 8-cent margin than it now is making or losing on a 4-cent margin."

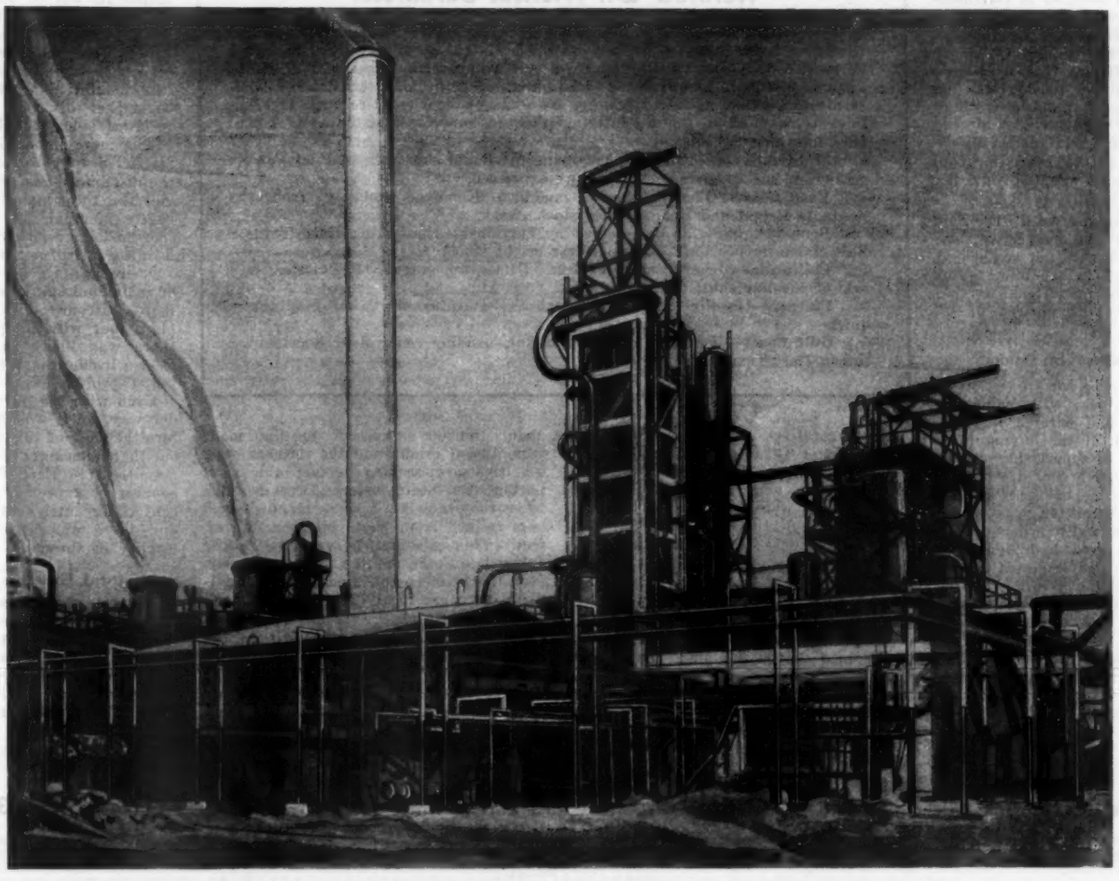
Which brings back the suggestion commented upon recently that the remedy may be found in a sliding scale margin under which the dealer will share the loss in price drops instead of being able to shave the price by sacrificing part of his margin to increase his gallonage and his own profits at the expense of the industry.

Now that these abuses have been brought out in the open and placed squarely before the industry some definite action may be taken if the interest of the industry at large can be put above the temporary temptation of immediate individual gain.

It is, as Mr. Byles suggested, a common problem to be worked out by the supplier, distributor and reseller in the interest of each of them as against, it might be added, the snipers on the outskirts of the industry who have nothing at stake in it.

The vagaries in marketing caused by the craze for gallonage, the salesmanship that thinks only of volume and not of profit, continue to amaze the industry. The spectacle of a seller wholesaling his product to a competitor who will break down their common market remains inexplicable. It does not make sense.

TRIAL AND ERROR HAS BEEN REPLACED BY RESEARCH AND KNOWLEDGE • • • • • • •



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Further Delay in Gasoline Buying Program Frays Nerves of Marketers in Group 3 Territory

By T. F. SMILEY

Efforts to watch simultaneously the fortunes of the gasoline purchasing program in East Texas, the A.P.I. convention in Dallas, and sessions in Oklahoma City of the congressional subcommittee investigating petroleum problems had refiners and marketers in the Oklahoma (Group 3) area suffering from eye strain this week. Still further tension was imposed Tuesday by news that the purchasing plan, previously announced as already under way, had been held up by discovery that approval of the Department of Justice, essential to its adoption, had not yet been obtained.

Frayed nerves among both the East Texas refiners and the prospective buying group of majors were not soothed by this additional delay in the undertaking to establish orderly operations in that district and to stabilize prices of oil products.

Wholeheartedness in Doubt

There appeared to be some question as to the wholeheartedness with which refiners and buyers had entered into the proposed resumption of the buying plan. L. A. Green, who is supervising details of the enterprise under the direction of the program committee of the Planning and Coordination Committee, was quoted as saying that practically every refiner in the East Texas area had signed up for the plan, which contemplates buying of the district's distress gasoline by the majors. Some of the refiners are said to have taken this action reluctantly. It was reported that all but two of the majors depended upon to absorb this East Texas motor fuel had signified their willingness to do so and that the two holdouts were expected to join with the others as soon as certain conditions had been met.

Refined Oil Market Barometer

Unsettled markets prevailed this week as a result of uncertainties overhanging the oil industry. Sudden suspension of the gasoline purchasing program in East Texas, pending approval or disapproval by the Department of Justice, just as it was expected to be put into operation, injected fresh concern into a situation already shaky. No sense of security in refined markets is expected until all factors entering into the complex East Texas problem have been disposed of.

Mid-Continent—Prices higher owing to virtual shutdown of East Texas refineries, but misgivings as to future expressed.

East Coast—Gasoline market muddled. Kerosene probably strongest product. Bright and steam-refined stocks weak.

Pennsylvania—Gasoline helped by curtailed output from East Texas. Seasonal influence lowers 25-pour test bright stock.

California—General market firm. Prices unchanged. Restriction on sale of gasoline substitutes beneficial.

Chicago—Gasoline strong, but inactive. Burning oils firm. Naphthas quiet.

Gulf Coast—Unsteady gasoline market, pending removal of uncertainties in East Texas.

Representatives of major companies went to East Texas early this week prepared to make purchases under the plan in conformity with allocations assigned them. They were reported as hopeful that the delay in operation of the plan would prove only temporary.

Some East Texas refiners are reported to have imposed certain conditions relative to their crude allocations and to disposal of gasoline now on hand made out of "hot" oil as the price of their entrance into the buying plan. These conditions are said to have been rejected by the purchasing officials. It was reported Tuesday there were two holdouts among the refiners.

There are said to be in East Texas about 100,000 gallons of gasoline made from illegal crude, and the refiners owning this are seeking to get rid of it within the State before December 25, when the state law against moving products refined from "hot" oil goes into effect. This gasoline is expected to be dumped on the State's market, wherever the refiners can find takers, and is likely to cause local price troubles until it is all absorbed.

The new contracts provide that the price of U. S. Motor low-octane gasoline, designated as the "basing grade," shall be 5 cents so long as the posted price of crude stays at $1. With each movement of 5 cents up or down in the price of crude the gasoline price is to move one-quarter cent in the same direction.

Virtual cessation of interstate gasoline shipments out of East Texas since the Federal Tender Board began its sittings in Kilgore three weeks ago, along with expectation that the revised purchasing plan was about to be in active operation, lifted quotations in the Oklahoma (Group 3) market this week to the highest levels recorded since last June.

The more impressive figures were not restricted to gasoline. They extended to the distillates, gas oils, kerosene and fuel oils. But these higher prices were in large degree nominal, for the same dearth of spot business reported throughout the last month was still noticeable.

There was a general feeling, regardless of individual opinions concerning the ultimate outcome of the gasoline buying plan, that with its promised resumption there was likely to be temporarily at least a livelier market at prices representing a profit.

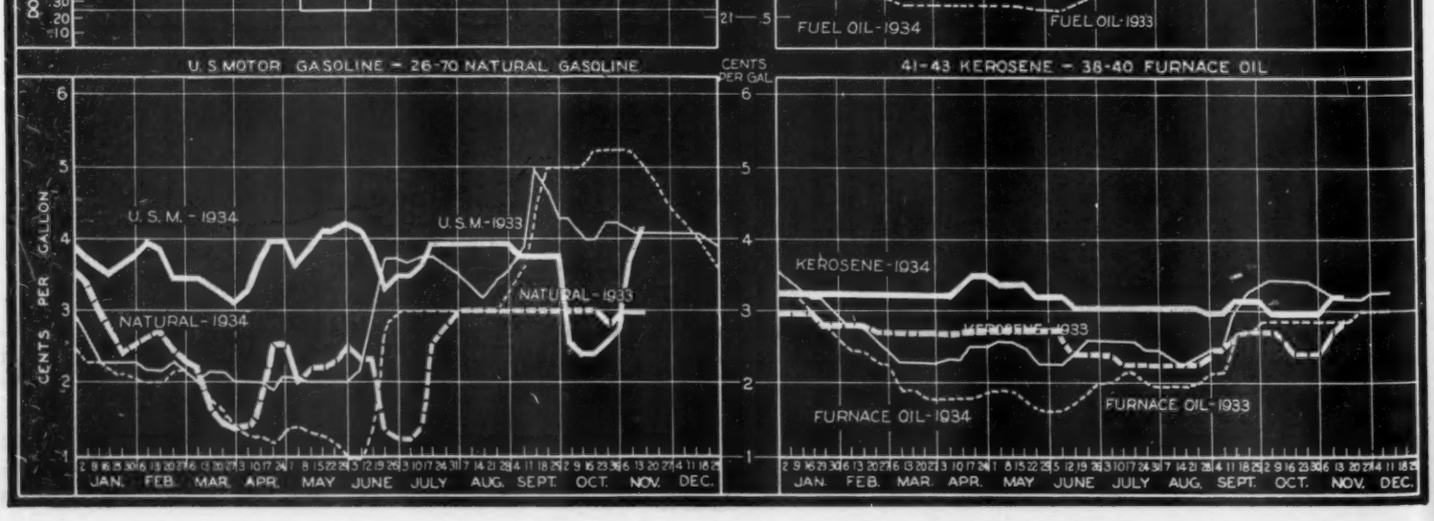
Even with the purchasing program under way, as it was hoped to have it before the close of this week, it was pointed out that immediate resumption of refinery operations in East Texas could not reasonably be expected, as less than 10 per cent of the area's capacity was running and there was little crude of certified legality in storage.

Natural Gasoline Looking Better

Natural gasoline was looking a little better. With fewer scattered lots of this material looking for takers the statistical position of the market had improved.

Absence of the old-time flood of high-volatility motor fuel from East Texas continued to stimulate the demand for natural for blending with the less volatile product from other areas.

Representative Mid-Continent Quotations on Crude Oil and Refined Products Basis Oklahoma (Group 3)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1934
1933
CENTS PER BBL GAL
16 GR. FUEL OIL – U.G.I. GAS OIL
GAS OIL - 1934
GAS OIL 1933
FUEL OIL - 1934
FUEL OIL - 1933
U. S. MOTOR GASOLINE – 26-70 NATURAL GASOLINE
CENTS PER GALLON
U. S. M. - 1934
U.S.M - 1933
NATURAL - 1934
NATURAL - 1933
CENTS PER GAL
41-43 KEROSENE – 38-40 FURNACE OIL
KEROSENE - 1934
KEROSENE - 1933
FURNACE OIL - 1934
FURNACE OIL - 1933
JAN. FEB. MAR. APR. MAY JUNE JULY AUG. SEPT. OCT. NOV. DEC.

Muddled Eastern Gasoline Situation Unchanged; Question of Differentials the Main Problem

By C. O. WILLSON
New York Bureau, The Oil and Gas Journal

NEW YORK, Nov. 12.—Another week has passed without bringing any definite solution to the muddled gasoline market situation in this territory. Additional meetings were held here this week for the purpose of ironing out difficulties between large and small distributors which have been responsible for the collapse in tank wagon and retail prices in this territory over the past several weeks. Although progress is reported in these negotiations in which government representatives have participated, no final agreement has been reached so far as known. These and other matters of importance in the gasoline market including the gasoline buying program are expected to receive consideration at informal meetings to be held at Dallas this week and predictions are heard that the gasoline market generally will present a more favorable picture before the end of the week.

In the meanwhile, gasoline tank car prices at East Coast points continue unchanged. Some improvement was noted in the domestic and export prices at the Gulf Coast the latter part of last week reflecting an improved condition at interior points in the Mid-Continent. Additional advances will be needed at the Gulf Coast to support the tank car market in this territory.

The fact that gasoline markets have not reached a basis for permanent improvement was shown in the developments of the past week. Tuesday, November 6, the Socony-Vacuum Oil Co., Inc., advanced gasoline tank wagon and service station prices from 1 to 4 cents a gallon at several points in upper New York State where price-war conditions had prevailed. It was hoped that the advances would be met by other companies and all of the major distributors did advance their quotations to the new levels.

Certain independent interests refused to meet the advances and by Thursday prices were again reduced at three or four important consuming centers. At Buffalo for example where the retail price on regular grade gasoline was advanced to 17 cents on Tuesday including taxes the price was dropped to 13 cents on Thursday. Prices were maintained at several points but the probable developments over the next few days were uncertain.

The main point of contention between the major and the so-called independent interests as revealed in the up-state New York developments and discussions which have taken place here over the past two weeks is the differential to be allowed between the branded gasoline products of the former and the unbranded products of the latter. There are several angles to this problem, conditions varying in different sections. In general, the independents insist on a differential of 1½ cents in service station prices between their regular grade and that of the major companies. It is known that three or four of the larger distributors in this territory have stated definitely that they will not consent to such a wide differential in the future with some insisting that the differential should not exceed one-half cent. The compromises which have been suggested have not secured the necessary general approval.

Any discussion of the differentials in service station prices necessarily must take into consideration the guaranteed margins allowed jobbers in refinery-jobber tank car agreements and also dealer margins including prices to large consumers. In fact, every marketing practice extending from the tank cars at the refineries to the service stations has been aired in these discussions with the hope that some plan can be arrived at which will receive sufficient approval to be made effective.

It now appears that certain major companies will continue firm in their position in not permitting any wide differentials between the prices at which their gasolines are sold and those of competitors regardless of the point of sale. One major executive contends that a 1½-cent differential or even a 1-cent differential in retail prices has no basis in comparative costs. He points out that there is no such thing as a cheap crude supply from which a cheap gasoline could be refined. The price of crude oil at the wells is the same to all buyers and the differences in posted schedules is largely based on the variation in value from the standpoint of gasoline manufacture. Due to this fact costs of raw material are the same to all refiners based on prices at the wells except in cases where "hot" oil operations are involved.

In regard to transportation and refining costs this executive points out that the advantage, if any, lies with the larger companies with their pipe line facilities and large processing units. As to gasoline quality the difference in costs at the refineries between the lowest octane material and the highest octane including the regular branded grades containing small quantities of Ethyl fluid does not exceed one-half cent a gallon. This is reflected in the fact that in open tank car quotations where all operations are based on legally produced crude oil the prices usually do not vary more than three-fourths cent per gallon between the lowest and best quality products.

Government Report

The following table summarizes the Bureau of Mines report covering refinery operations for the East Coast for September released last week with similar data for August and September, 1933:

EAST COAST REFINERY OPERATIONS

(Data in barrels)

	Production		
	Sept., 1934	Sept., 1933	Aug., 1933
Crude to stills	13,529,000	13,870,000	14,900,000
Gasoline	5,421,000	5,844,000	5,968,000
Kerosene	761,000	703,000	723,000
Gas oil and distillate	1,598,000	1,108,000	1,764,000
Residual oils	3,604,000	3,826,000	3,631,000
Lub oils	598,000	678,000	590,000
Wax (lbs.)	15,680,000	22,400,000	17,080,000
Coke (tons)	10,800	16,400	12,200
Asphalt (tons)	124,200	94,400	160,900
Road oils	36,000	70,000	104,000
Stocks End of Month			
Gasoline*	13,942,000	14,041,000	14,741,000
Kerosene	1,981,000	2,261,000	1,943,000
Gas oil and distillate	6,376,000	5,105,000	5,625,000
Residual oils	8,344,000	4,685,000	7,786,000
Lub oils	2,191,000	2,282,000	2,042,000
Wax (lbs.)	52,261,000	20,507,000	53,188,000
Coke (tons)	30,800	57,200	29,100
Asphalt (tons)	104,400	80,100	111,300
Road oils	47,000	131,000	76,000

*At refineries, bulk stations and pipe lines.

The most important data given in the reports for the three months have to do with stocks. It will be noted that stocks of gas oil and distillate and residual oils increased in September. Compared to September 30, 1933, stocks on September of this year were approximately 75 per cent greater. Inventories of gas oil and distillates also are greater. Wax stocks are 150 per cent greater than they were a year ago with gasoline stocks less. Refiners in this territory have succeeded in reducing their coke piles over the past year, the total on September 30 being only 30,000 tons. Coke production has greatly decreased due to the more favorable market for residual oils.

Costs in Marketing

When it comes to costs in marketing the differences are due mainly to volume handled at the stations. When a station operator reduces his prices and greatly increases his volume his costs with the same labor and investment obviously are less per unit sold. However, the same situation would apply to any large company if it were permitted to reduce its prices below those of its competitors. In brief this executive maintains that the differences in costs of gasoline between the large integrated and independent units are less than one-half cent per gallon in the regular domestic grades provided all operations are conducted on a legitimate basis and no unwarranted advantage is given to independent units in the quantity of gasoline sold per station. This particular operator believes that this basic situation must be recognized by all concerned and prices adjusted accordingly before there can be any permanent stabilizations in marketing.

Prices

The domestic market in tank cars in the New York harbor area remains at 5¼ cents for low octane, 5½ cents for middle octane, 5¾ cents for high octane and 6 cents for branded regular grades containing tetraethyl fluid. Prices are one-fourth cent less for small barge deliveries of the three white grades. Open market trading in all of these grades is low.

Kerosene probably is the strongest product in this market. Supplies have tightened up and the demand has improved. The market is firm over a price range of 5 to 5¼ cents. The furnace oils are not as active as kerosene and this is explained in part as due to the weather which has not been cold enough to bring about a large consumer demand. Prices range from 4½ to 5 cents depending on grade.

In the marine trade, Bunker C fuel continues at $1.15 with Diesel fuel at $1.89. The demand is fair with supplies

(Continued on Page 134)

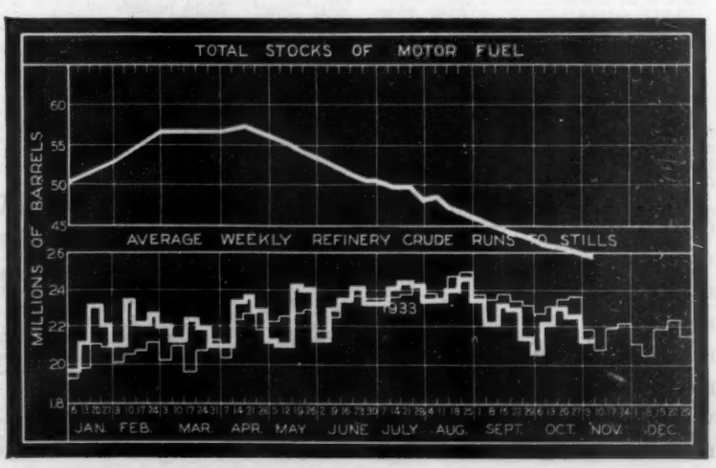
American Petroleum Institute Weekly Refinery Statistics

Week Ending November 3, 1934*

	Capacity reporting per cent	Daily crude runs (bbls.)	Finished motor fuel (bbls.)	Gas oil and fuel oil (bbls.)
East Coast	100.0	462,000	12,758,000	14,946,000
Appalachian	93.3	73,000	1,580,000	1,635,000
Indiana, Illinois, Kentucky	94.6	305,000	6,428,000	5,187,000
Oklahoma, Kansas, Missouri	83.7	202,000	3,565,000	3,770,000
Inland Texas	47.6	82,000	915,000	1,495,000
Texas Gulf	97.5	470,000	3,935,000	10,643,000
Louisiana Gulf	96.4	90,000	1,153,000	3,433 000
North Louisiana and Arkansas	83.7	45,000	201,000	576,000
Rocky Mountain	66.7	38,000	420,000	537,000
California	96.9	379,000	10,580,000	72,947,000
Total United States	89.7	2,146,000	41,535,000	115,169,000

*Report for week ending November 10 delayed because of Armistice Day.

Note: Finished motor stocks shown in graph and in table included those at refineries, at bulk terminals and in pipe lines, but do not include 5,000,000 to 7,000,000 bbls. of unfinished gasoline which could be reprocessed quickly.



REFINERY AND CRUDE PRICES

Quotations on refined products are for interstate or export movement except as otherwise noted

The following quotations are exclusive of the Federal excise taxes of 1 cent a gallon on gasoline and 4 cents on lubricating oils.

Refinery Gasolines

	Nov. 13		Nov. 6	
OKLAHOMA (Group 3)—				
U. S. Motor grades:				
Below 63 octane	.04⅛	.04¼	.03¾	.04
63-70 octane	.04⅝	.04⅞	.04½	.04¾
60-62 400 grades:				
Below 63 octane	.04⅛	.04¼	.03¾	.04
63-70 octane	.04⅝	.04⅞	.04½	.04¾
64-66 375	.04⅜	.04¼	.03⅞	.04⅛
68-70 360	.04¼	.04⅜	.04	.04½
NORTH TEXAS—				
U. S. Motor grades:				
Below 63 octane	.04⅛	.04¼	.03¾	.04
63-70 octane	.04⅝	.04⅞	.04½	.04¾
60-62 400	.04⅛	.04¼	.03¾	.04
64-66 375	.04⅜	.04¼	.03⅞	.04½
NORTH LOUISIANA (Ark., N. La. & Miss. del.)—				
U. S. Motor grades:				
Below 63 octane	.04¼	.04½	.04¼	
63-70 octane	.05	.05¼	.05	
60-62 400	.04¼	.04½	.04¼	
68-70 360	.05	.05¼	.05	
ARKANSAS (Ark., N. La. & Miss. del.)—				
U. S. Motor grades:				
Below 63 octane	.04¼	.04½	.04¼	
63-70 octane	.05	.05¼	.05	
CHICAGO (based on Oklahoma Group 3)—				
U. S. Motor grades:				
Below 63 octane	.04	.04¼	.03¾	.04
63-70 octane	.04⅞	.05	.04¾	.05
60-62 400	.03¾	.04	.03¾	.04
64-66 375	.03¾	.04	.03¾	.04
68-70 360	.03⅞	.04⅛	.03⅞	.04⅛
Aviation fighting grade	.04¾	.05	.04¾	.05
PENNSYLVANIA (inland refineries)—				
58-60 U. S. Motor:				
Below 60 octane	.05		.04¾	
60-64.9 octane	.06		.06	
65-70 octane	.06⅜		.06⅜	
68-70 350	.06⅛		.06⅛	
CALIFORNIA (domestic movement)—				
54-58 U. S. Motor	.07	.08	.07	.08
58-60 400	.08	.09	.08	.09
EAST COAST—				
U. S. Motor, below 60 octane:				
*New York	.05¼		.05¼	
Baltimore	.05¼		.05¼	
U. S. Motor, 60-64 octane:				
*New York (Bayonne)	.05½		.05½	
Philadelphia	.05½	.05¾	.05½	.05¾
Boston	.05¾		.05¾	
Baltimore	.05½		.05½	
Charleston, S. C.	.05½		.05½	
U. S. Motor, 65 and above:				
*New York	.05¾		.05¾	
Philadelphia	.05¾		.05¾	
Boston	.05¾	.06	.05¾	.06
Baltimore	.05¾		.05¾	
Charleston, S. C.	.05¾		.05¾	

*All grades of gasoline one-fourth cent less for small barge shipments.

GULF COAST (domestic)—				
U. S. Motor:				
Below 60 octane	.05		.05	
60-64.9 octane	.05½	.05⅝	.05½	.05⅝
65 octane and higher	.05½	.05⅝	.05½	.05⅝

Naphthas

	Nov. 13		Nov. 6	
PENNSYLVANIA (inland refineries)—				
50-52 (blending)	.04⅞		.04⅝	
52-54 450 (blending)	.04⅞		.04⅝	
54-56 450 (blending)	.04⅞		.04⅝	
50-52 450 (blending)	.04⅞		.04⅝	
CHICAGO (based on Oklahoma Group 3)—				
50-52 450 (blending)	.04	.04¼	.03¾	.04
Cleaners' naphtha, 56-58 gr., 200 i.b.p.-320 e.p.	.06¾	.07	.06¾	.07
Lacquer diluent, 180 i.b.p.-250 e.p.	.07¾	.08	.07¾	.08
Lacquer diluent, 140 i.b.p.-200 e.p.	.08¾	.09	.08¾	.09
Rubber solvent, 68-70 gr., 100 i.b.p.-300 e.p.	.06¾	.07	.06¾	.07
Stoddard solvent, 300 i.b.p.-410 e.p., over 83° flash	.06¼	.06½	.06¼	.06½
Pet. thinner, 290-300 i.b.p.-415 e.p., over 83° flash	.06¼	.06½	.06¼	.06½
V.M.&P. naphtha, 56-58 gr., 190-200 i.b.p.-330 e.p.	.06¾	.07	.06¾	.07
Petroleum spirits	.05¾	.06	.05¾	.06

Natural Gasolines

	Nov. 13		Nov. 6	
OKLAHOMA (Group 3)—				
Grade 26-70	.03		.03	
Grade 18-55	.03½	.03⅝	.03⅝	
Low vapor pressure grades:				
14 lb. v.p. (max.)	.03¾	.04	.03¾	.04
11 lb. v.p. (max.)	.04¼	.04½	.04¼	.04½
NORTH TEXAS—				
Grade 26-70	.02⅝	.02¾	.02⅝	.02¾
Grade 18-55	.03⅜		.03⅜	
Low vapor pressure grades:				
14 lb. v.p. (max.)	.03⅝	.03¾	.03⅝	.03¾
11 lb. v.p. (max.)	.04	.04¼	.04	.04¼
NORTH LOUISIANA (Ark., N. La. & Miss. del.)—				
Grade 26-70	.03⅜		.03⅜	
CALIFORNIA—				
75-85 375	.06½	.06¾	.06½	.06¾

Kerosenes

(All kerosenes water white)

	Nov. 13		Nov. 6	
OKLAHOMA (Group 3)—				
41-43	.03¼	.03½	.03¼	.03½
42-44	.03½	.03⅝	.03⅜	.03⅝
NORTH TEXAS—				
40-41	.03	.03½	.02⅞	.03⅛
41-43	.03¼	.03⅜	.03	.03¼
NORTH LOUISIANA (Ark., N. La. & Miss. del.)—				
41-43	.03⅜		.03⅜	
ARKANSAS (Ark., N. La. & Miss. del.)—				
41-43	.03⅜	.03½	.03⅜	.03½
PENNSYLVANIA (inland refineries)—				
45	.04½	.04⅝	.04⅝	
46	.04⅝	.04¾	.04¾	
47	.04¾	.04⅞	.04⅞	
CHICAGO (based on Oklahoma Group 3)—				
41-43	.03¼	.03⅜	.03¼	.03¼
42-44	.03½	.03⅝	.03⅜	.03½
CALIFORNIA (Pacific Coast consumption)—				
38-40 high burning test	.04¾	.05¼	.04¾	.05¼
NEW YORK (Bayonne, N. J.)—				
41-43	.05	.05¼	.05	.05¼
GULF COAST (domestic)—				
41-43	.04½	.04⅝	.04½	.04⅝

Petroleum Coke

(Prices per ton f.o.b. refineries in Chicago area)
(Refineries will absorb freight to 80 cents a ton)

	Nov. 13	Nov. 6
Still run	5.75	5.75
Direct from still	6.75	6.75
Egg, nut, pea	8.25	8.25
Lump	8.25	8.25

Furnace Oils and Tractor Fuels

(Zero cold test under 190° flash and good odor)

	Nov. 13		Nov. 6	
OKLAHOMA (Group 3)—				
32-36 straw	.02¾	.03	.02¾	.02⅞
36-38 straw	.02⅞	.03	.02⅝	.02¾
38-40 straw	.02⅞	.03	.02¾	.02⅞
38-40 prime white	.03⅛	.03¼	.02⅞	.03
NORTH TEXAS—				
38-40 straw	.02⅞	.03	.02⅜	.02⅞
NORTH LOUISIANA (Ark., N. La. & Miss. del.)—				
36-40 furnace oil	.02⅞	.03	.02¾	.02⅞
ARKANSAS (Ark., N. La. & Miss. del.)—				
32-36 furnace oil	.02⅞	.03	.02¾	.02⅞
CHICAGO (based on Oklahoma Group 3)—				
32-36 straw	.03	.03⅛	.02¾	.03
38-40 straw	.03	.03⅛	.02¾	.03
38-40 prime white	.03⅛	.03¼	.02⅞	.03⅛
NEW YORK (Bayonne, N. J.)—				
No. 1	.05	.05¼	.05	.05¼
No. 2	.04½		.04½	
No. 4	.04½		.04½	

Gas Oil, Diesel Oil and Fuel Oil

(Gas oil per gallon; Diesel and fuel oils per barrel)

	Nov. 13		Nov. 6	
OKLAHOMA (Group 3)—				
32-36 gas oil cracking stock	.01⅞	.02	.01¾	.02
U.G.I. gas oil	.02	.02⅛	.01¾	.02
32-36, zero to 15 gas oil	.02¾	.02¾	.02½	.02⅝
28-30, No. 3 burner oil	.97½	1.02½	.97½	1.02½
26-30, zero to 10 fuel oil	.85	.95	.85	.95
24-26 fuel oil	.77½	.80	.75	.80
20-22 fuel oil	.72½	.75	.70	.72½
Below 16 fuel oil	.60	.62½	.60	.62½
NORTH TEXAS—				
32-36 gas oil, industrial	.01⅞	.02⅛	.01¾	.02
22-26 fuel oil	.67½	.70	.67½	.70
Below 20 fuel oil	.57½	.62½	.57½	.62½
NORTH LOUISIANA (Ark., N. La. & Miss. del.)—				
30-32 gas oil, zero	.02½	.02¾	.02½	.02¾
14-16 fuel oil	.70	.75	.70	.75
ARKANSAS (Ark., N. La. & Miss. del.)—				
30-32 gas oil, zero	.02½	.02¾	.02½	.02¾
32-36 gas oil	.02½	.02⅝	.02½	.02⅝
14-16 fuel oil	.70	.75	.70	.75
CHICAGO (based on Oklahoma Group 3)—				
32-36 gas oil, industrial	.01⅞	.02	.01⅞	.02
28-30 zero to 10, fuel oil	.95	1.00	.95	1.00
26-28 zero to 10, fuel oil	.85	.90	.85	.90
22-26 zero to 10, fuel oil	.75	.80	.75	.80
18-22 zero to 10, fuel oil	.62½	.67½	.62½	.67½
Below 18 fuel oil	.55	.60	.55	.60

Note: Fuel oils of more than 40 cold test generally 5 to 15 cents per barrel in all these areas.

PENNSYLVANIA (inland refineries)—				
36-40	.03⅝		.03⅝	
CALIFORNIA—				
Los Angeles:				
30-34 gas oil per bbl.	1.10	1.26	1.10	1.26
27 plus Diesel	1.10	1.15	1.10	1.15
27 plus Diesel (bunkers)	1.13	1.20	1.13	1.20
12-16 (bunkers at tidewater)	.82	.85	.82	.85
10-16 (cargo lots)	.66	.75	.66	.75
12-17 (tank cars)	.55	.80	.55	.80
San Joaquin Valley:				
10-18 (tank cars)	.50	.70	.50	.70
San Francisco:				
27 plus Diesel per bbl.	1.15	1.25	1.15	1.25
27 plus Diesel (bunkers)	1.19		1.19	
10-16 (bunkers)	.89		.89	
GULF COAST—				
28-30 gas oil	.03½	.03⅝	.03½	.03⅝
28-30 Diesel (bunkers)	1.70		1.70	
Bunker C (bulk cargoes)	.85	.90	.85	.90
Bunker C (bunkers)	.95	1.00	.95	1.00
NEW YORK (Bayonne, N. J.)—				
27 plus, gas oil	.04¼	.04½	.04¼	.04½
28-30 Diesel (lighterage 6½ cents per bbl.)	1.89		1.89	
28-30 Diesel (tank cars)	.04½	.04¾	.04½	.04¾
*Bunker C (to ocean-going ships in N. Y. harbor)	1.15		1.15	

*Lighterage charge 5 cents per barrel additional.

Neutral Oils

(Vis. at 100° F. except Pennsylvania, and color N.P.A.)

	Nov. 13		Nov. 6	
OKLAHOMA (Group 3)—				
Zero to 10 Cold Test:				
150-3	.10		.10	
180-3	.11¼		.11¼	
180-4	.10¾		.10¾	
200-3	.11¾		.11¾	
200-4	.11¼		.11¼	
240-3	.13¾		.13¾	
240-4	.13¼		.13¼	
280-3	.14¾		.14¾	
280-4	.14		.14	
300-3½	.15¼		.15¼	
400-4	.17¼		.17¼	
100-2 paraffin oil	.05¾		.05¾	
15-20 Cold Test:				
200-3	.10¾		.10¾	
200-4	.10¼		.10¼	
240-3	.12¾		.12¾	
240-4	.12¼		.12¼	
280-3	.13¾		.13¾	
280-4	.13		.13	
GULF COAST—				
Pale Oils:				
200-3	.07¼	.07½	.07¼	.07½
300-3	.07½	.08	.07½	.08
500-3½	.08½	.09	.08½	.09
750-3½	.09	.09¼	.09	.09¼
1,200-3½	.09½	.09¾	.09½	.09¾
2,000-4	.09¾	.10	.09¾	.10
Red Oils:				
200-5-6	.07	.07¼	.07	.07¼
300-5-6	.07¼	.07½	.07¼	.07½
500-5-6	.08	.08½	.08	.08½
750	.08½	.09	.08½	.09
1,200-5-6	.09¼	.09½	.09¼	.09½
CALIFORNIA—				
Pale Oils:				
100-2½-3	.12½	.14½	.12½	.14½
200-2½-3	.12½	.14½	.12½	.14½
300-3-3½	.12½	.14½	.12½	.14½
350-3-4	.12½	.14½	.12½	.14½
400-3-4	.12½	.14½	.12½	.14½
450-3-4	.12½	.14½	.12½	.14½
550-3-4	.12½	.14½	.12½	.14½
600-3-4	.12½	.14½	.12½	.14½
Red Oils:				
200-4-5	.12½	.14½	.12½	.14½
300-5-6	.12½	.14½	.12½	.14½
350-5-6	.12½	.14½	.12½	.14½

400-5-6	.12½	.14½	.12½	.14½
450-5-6	.12½	.14½	.12½	.14½
500-5-6	.12½	.14½	.12½	.14½
600-5-6½	.12½	.14½	.12½	.14½
700-6½ plus	.12½	.14½	.12½	.14½
750-6½ plus	.12½	.14½	.12½	.14½
900-6½ plus	.12½	.14½	.12½	.14½
PENNSYLVANIA—				
150 vis. at 70° F., 3 color, 400-405 flash:				
Zero pour test	.23½	.24	.23½	.24
10 pour test	.22½	.23	.22½	.23
15 pour test	.22	.22½	.22	.22½
25 pour test	.21	.21½	.21	.21½
180 vis. at 70° F., 3 color:				
25 pour test	.24½	.25	.24½	.25
200 vis. at 70° F., 3 color:				
Zero pour test	.30	.30½	.30	.30½
10 pour test	.29	.29½	.29	.29½
15 pour test	.28½	.29	.28½	.29
25 pour test	.27½	.28	.27½	.28

Bright and Steam Refined Stocks

OKLAHOMA (Group 3)—	Nov. 13		Nov. 6	
Bright Stocks:				
190-200 D	.18		.18	
150-160 D, 0-10	.15		.15	
150-160 D, 10-25	.14½		.14½	
150-160 24-40	.14		.14	
150-160 E	.14		.14	
Steam refined:				
630 light green (treated)	.13		.13	
600 light green (untreated)	.06	.08	.06	.08
600 dark green (untreated)	.04½	.07	.04½	.07
PENNSYLVANIA—				
Bright Stocks (Pennsylvania grade, No. 8 color, 145-50 at 210; 540-550 flash):				
10 pour test	.20½	.22	.20½	.22
15 pour test	.19½	.21½	.19½	.21½
20 pour test	.19	.21	.19	.21
25 pour test	.16½	.18	.17	.18
Steam refined:				
600	.09½	.10½	.09½	.10½
650	.13	.13½	.13	.13½
600 Pennsylvania flash	.14	.14½	.14	.14½
630 flash	.18	.18½	.18	.18½
600 Warren E filtered	.14	.14½	.14	.14½

Wax and Petrolatum

(Prices per pound)

OKLAHOMA (Group 3)—	Nov. 13		Nov. 6	
124-126 white crude scale	.03¼	.03⅜	.03¼	.03⅜
PENNSYLVANIA—				
122-124	.0325	.0330	.0325	.0330
124-126	.0330	.0335	.0330	.0335
NEW YORK—				
Wax (a.m.p.) in bags fully refined:				
120-122	.0420	.0430	.0420	.0430
123-125	.0440	.0460	.0440	.0460
125-127	.0445	.0470	.0445	.0470
130-132	.05	.0510	.05	.0510
133-135	.0545	.0570	.0545	.0570
135-137	.0570	.0595	.0570	.0595
124-126 crude scale	.03⅛	.03¼	.03¼	
Petrolatum in barrels in carload lots:				
Dark green	.01⅞		.01⅞	
Amber	.02⅛	.03	.02⅞	.03
Extra amber	.03	.03⅛	.03	.03⅛
Lily white	.06⅝	.06¾	.06⅝	.06¾
Snow white	.07¾	.07⅞	.07¾	.07⅞
Cream	.05⅝	.05¾	.05⅝	.05¾
CHICAGO (f.o.b. switching district)*—				
122-124 wax	.0490	.0500	.0490	.0500
125-127 wax	.0515	.0525	.0515	.0525
127-129 wax	.0530	.0540	.0530	.0540
130-132 wax	.0590	.0600	.0590	.0600
132-134 wax	.0615	.0625	.0615	.0625

*Cents per pound on carlot orders in burlap bags of 225 lbs. approx. Add 3° F. a.m.p.

Export Prices

GASOLINE

GULF COAST —	Nov. 13	Nov. 6
U. S. Motor	.03⅞	.03⅞
60-62 400	.04	.04
61-63 390	.04⅛	.04¼	.04⅛	.04¼
64-66 375	.04⅜	.04⅜
LOS ANGELES, CALIF.—				
U. S. Motor grades:				
53-55 octane	.04	.04¼	.04	.04¼
55-65 octane	.04¼	.04½	.04¼	.04½
65-67 octane	.04½	.04¾	.04½	.04¾
67-69 octane	.04¾	.05	.04¾	.05
Above 69 octane	.05	.05¼	.05	.05¼
58-60 400 endpoint	.04¾	.05½	.04¾	.05½

KEROSENE

GULF COAST—				
41-43 prime white	.03⅞		.03⅞	
41-43 water white	.04		.04	
44 water white	.04⅛		.04⅛	
LOS ANGELES, CALIF.—				
41-43 water white	.04¼	.04¾	.04¼	.04¾

LUBRICANTS

NEW YORK (f.a.s. in bbls.)—				
Cylinder Stocks:				
600 Warren E	.20	.20¼	.20	.20½
600 S.R. unfiltered	.15½	.16	.16	.16½
650 S.R. unfiltered	.18	.18½	.18¼	.18½
600 flash S.R.	.19	.19½	.19	.19½
630 flash S.R.	.23	.23½	.23½	.24
Bright Stocks:				
8 color	.22½	.23	.24	.24½
6½ plus color, in dilution	.21½	.22	.23	.23½

NEUTRAL OILS

200-3 color	.34	.35	.34	.35
150-3 color	.27	.28	.27	.28

PARAFFIN WAX (Fully Refined)

NEW YORK (prices per pound)—				
120-122 a.m.p.	.0405	.0425	.0405	.0425
123-125 a.m.p.	.0435	.0455	.0435	.0455
125-127 a.m.p.	.0440	.0465	.0440	.0465
128-130 a.m.p.	.04¾	.0490	.04¾	.0490
130-132 a.m.p.	.0495	.0505	.0495	.0505
133-135 a.m.p.	.0540	.0565	.0540	.0565
135-137 a.m.p.	.0565	.0590	.0565	.0590

Crude Oil Gravity Table

Gravity—	1 Oklahoma and Kansas	2 North Texas, Central Texas and East Central Texas	3 North Louisiana and Arkansas	4 Gray County, Texas	5 Carson, Hutchinson and Moore Counties, Texas	6 Conroe, Texas	7 Salt Creek, Wyo.	8 Gulf Coast, Texas and Louisiana	9 Gulf Coast, Texas and Louisiana	10 Cotton Valley, Louisiana
Below 20	....	....	....	....	....	....	....	$.82	$.82	....
20-20.9	....	....	....	....	....	....	....	.84	.84	....
21-21.9	....	....	....	....	....	....	....	.86	.86	....
22-22.9	....	....	....	....	....	....	....	.88	.88	....
23-23.9	....	....	....	....	....	....	....	.90	.90	....
24-24.9	....	....	....	....	....	....	....	.92	.92	....
Below 25	*$.76	....	....	....	....	....	....	....	....	$.70
25-25.9	*.78	....	....	....	....	....	....	.94	.94	.72
26-26.9	*.80	....	....	....	....	....	....	.96	.96	.74
27-27.9	*.82	....	....	....	....	....	....	.98	.98	.76
28-28.9	*.84	....	....	....	....	....	....	1.00	1.00	.78
Below 29	.84	$.79	$.79	....	....	....	$.84	....	....	....
29-29.9	.86	.81	.81	....	....	....	.86	1.02	1.02	.80
30-30.9	.88	.83	.83	....	....	....	.88	1.04	1.04	.82
31-31.9	.90	.85	.85	....	....	....	.90	1.06	1.06	.84
32-32.9	.92	.87	.87	....	....	....	.92	1.08	1.06	.86
33-33.9	.94	.89	.89	....	....	....	.94	1.10	1.07	.88
34-34.9	.96	.91	.91	....	....	....	.96	1.12	1.08	.90
Below 35	....	....	....	$.79	$.69	....	....	....	....	....
35-35.9	.98	.93	.93	.81	.71	$1.09	.98	1.12	1.09	.92
36-36.9	1.00	.95	.95	.83	.73	1.11	1.00	1.12	1.10	.94
37-37.9	1.02	.97	.97	.85	.75	1.13	1.02	1.12	1.11	.96
38-38.9	1.04	.99	.99	.87	.77	1.15	1.04	1.12	1.12	.98
39-39.9	1.06	1.01	1.01	.89	.79	1.17	1.06	1.12	1.13	1.00
40 and over	1.08	1.03	1.03	.91	.81	1.19	1.08	1.12	1.14	1.02

Note—On November 6, Kanotex Refining Co. and Globe Oil & Refining Co. resumed the Oklahoma-Kansas price schedule shown in Column 1 in the table, making the prices retroactive to October 25, which was the day they cut their prices 46 cents per barrel.

*The following companies purchasing crude oil in Kansas or Oklahoma, or both, begin their price schedule: Below 25°, 76 cents; 25-25.9°, 78 cents, with 2 cents added for each degree upward to 40 and over at $1.08; Carter Oil Co., Magnolia Petroleum Co., Pure Oil Co., Rock Island Refining Co., Shell Petroleum Corp., Sinclair Prairie Oil Marketing Co., Skelly Oil Co., and Wilcox Oil & Gas Co. All others begin their schedules at below 29°, 84 cents, excepting Philtex Oil Co., which begins with below 31° at 88 cents.

Column 1—Effective September 29, Texas Co. of Oklahoma; Stanolind Crude Oil Purchasing Co. in Kansas and Oklahoma; Anderson & Prichard, Inc., in Oklahoma; Bell Oil & Gas Co. in Oklahoma; Carter Oil Co. in Oklahoma and Kansas; Deep Rock Oil Co. in Oklahoma; Derby Oil Co. in Kansas; Globe Refining Co. in Oklahoma; Golden Rule Refining Co. in Kansas; Gypsy Oil Co. in Oklahoma and Kansas; Kanotex Refining Co. in Kansas; Magnolia Petroleum Co. in Oklahoma; Mid-Continent Petroleum Corp. in Oklahoma; National Refining Co. in Kansas and Oklahoma;; Shell Petroleum Corp. in Kansas and Oklahoma; Sinclair Prairie Oil Marketing Co. in Kansas and Oklahoma; Texas Co. in Oklahoma; Tide Water Oil Co. in Oklahoma; Vickers Refining Co. in Kansas; Continental Oil Co. in Kansas and Oklahoma; Empire Pipe Line Co. in Oklahoma and Kansas; Philtex Oil Co. in Kansas and Oklahoma; Pure Oil Co. in Oklahoma; Skelly Oil Co. in Kansas. Effective September 29, by White Eagle Oil Corp. in Kansas; October 1 by Barnsdall Refineries, Inc., in Oklahoma.

Column 2—Effective September 29, by Texas Co., Stanolind Crude Oil Purchasing Co., Humble Oil & Refining Co., Sinclair Prairie Oil Marketing Co., Gulf Pipe Line Co., Magnolia Petroleum Co., Bell Oil & Gas Co., Continental Oil Co. Effective September 29, in the Van Pool, Van Zandt County, Pure Oil Co. posted below 29°, 84 cents, with 2 cents added for each degree up to 40 and over at $1.08.

Column 3—Effective September 29, by Texas Co., Magnolia Petroleum Co., Gulf Refining Co. Effective December 22, Stanolind Oil & Gas Co. in Pine Island, Louisiana, and Marion County, Texas, posted below 29°, 79 cents, with 2 cents added for each degree up to 40 and over at $1.03. Effective March 17, 1934, by Standard Oil Co. of Louisiana and Louisiana Oil Refining Co. Starting with below 25°, 71 cents, adding 2 cents for each degree upward to 40 and over at $1.03.

Column 4—Effective September 29, by Texas Co., Humble Oil & Refining Co., Magnolia Petroleum Co., Sinclair Prairie Oil Marketing Co., and H. F. Wilcox Oil & Gas Co. On same day Philtex Oil Co. posted below 31°, 71 cents, with 2 cents added for each degree up to 40 and over at 91 cents. Effective June 1, 1934, Texas Co. (see note above).

Column 5—Effective September 29, by Texas Co., Humble Oil & Refining Co., Gulf Pipe Line Co., Magnolia Petroleum Co., Wilcox Oil & Gas Co., Continental Oil Co. On same day, Philtex Oil Co. posted below 31°, 61 cents, with 2 cents added for each degree upward to 40 and over at 81 cents. Effective June 1, 1934, Texas Co. (see note above).

Column 6—Effective September 29, by Humble Oil & Refining Co. and Tide Water Oil Co. and on September 30, by Texas Co., which on September 29 had posted a schedule of $1.07 to $1.12 with a 1-cent spread on each degree.

Column 7—Effective September 29, by Stanolind Oil & Gas Co.

Column 8—Effective September 29, by Humble Oil & Refining Co., Gulf Pipe Line Co., Shell Petroleum Corp., Pure Oil Co., Sinclair Prairie Oil Marketing Co. On October 2, Magnolia Petroleum Co. posted Lockport, Louisiana; 20-20.9°, 84 cents with 2 cents added for each degree upward to 34 and over at $1.12, and in Cameron Meadows and Iowa, Louisiana; below 20°, 72 cents with 2 cents added for each degree up to 34 and over at $1.02. These prices were 2 cents higher on each degree than Magnolia prices posted on September 29. Effective September 29, Shell Petroleum Corp. posted in Iowa, Louisiana, district: Below 20°, 70 cents, with 2 cents added for each degree upward to 34° and over at $1; and in Black Bayou and White Castle, Louisiana: Below 20°, 80 cents, with 2 cents added for each degree upward to 34° and over at $1.10.

Column 9—Effective September 30, Texas Co. (On September 29, Texas Co. had posted a schedule of 2 cents on each degree, but changed it on September 30.)

Column 10—Effective September 29, by Louisiana Oil Refining Co.

(California Crude Oil Prices on Page 135)

Crude Oil Prices

Oklahoma, Kansas, North Central and East Central Texas

East Texas $1.00
Corsicana (heavy) (June 17, 1933)* ..... .80
Other fields ..... (See gravity table)

Note—In East Texas, effective September 29, 1933, by Texas Co., Stanolind Crude Oil Purchasing Co., Humble Oil & Refining Co., Shell Petroleum Corp., Gulf Pipe Line Co., Tide Water Oil Co., Sinclair Prairie Oil Marketing Co., Magnolia Petroleum Co., Sun Oil Co., Panola Pipe Line Co., Empire Oil & Refining Co., and Atlas Pipe Line Co. posted 60 cents per barrel in East Texas, but on November 3 resumed its posted price of $1 per barrel, making it retroactive to October 22.

*Magnolia Petroleum Co.

West Texas

Crane, Upton, Crockett, Howard, Glasscock, Mitchell (Sept. 29, 1933) ..... $.70
Ector, Winkler and Pecos Counties and Lea County, New Mexico (Sept. 29, 1933) ..... .75
Pecos County, Yates shallow Pool (Sept. 29, 1933)* ..... .65
Jones and Fisher Counties*. See gravity table

Note—Effective September 29, 1933, by Humble Oil & Refining Co., Texas Co., Gulf Pipe Line Co., Shell Petroleum Corp., Magnolia Petroleum Co., and by Stanolind Oil & Gas Co. in Winkler County, Texas.

*Shell Petroleum Corp.

Gulf Coast

Grade A and Grade B specifications discontinued by leading buyers. ..... (See gravity table)
Tomball (see note)* $1.10
Livingston (Sept. 29, 1933)† 1.00
Cleveland (Jan. 11, 1934) 1.00
Greta (Sept. 29, 1933) ..... .85
Refugio, light ..... (See gravity table)
Refugio, heavy (Sept. 29, 1933)‡ ..... .85
Markham and High Island ..... (See Gulf Coast gravity table)
Conroe ..... (See Conroe gravity table)
Bosco, La. (Oct. 15, 1934)§ $1.02

Note—Tomball, effective September 29, by Humble Oil & Refining Co. and October 2 by Magnolia Petroleum Co., and November 10 by Stanolind Oil & Gas Co.

*Greta posted by Texas Co. †Shell Petroleum Corp. ‡Refugio heavy by Humble Oil & Refining Co. Cleveland (Liberty County) posted by Magnolia Petroleum Co. §Bosco posted by Pure Oil Co.

South Central and Southwest Texas

(See note below table)

Darst Creek ..... $.87
Mirando ..... .80
Luling (Sept. 29, 1933) ..... .75
Pettus 1.05
Salt Flat ..... .87
Lytton Springs (Sept. 29, 1933) ..... .95
Duval County (Sept. 29, 1933) ..... .80
Saxet ..... .85

Note—Effective on September 29 by Humble Oil & Refining Co. in Darst Creek, Mirando, Pettus, Salt Flat and Saxet. Effective September 29 in Darst Creek by Gulf Pipe Line Co. and Texas Co. Effective October 2 by Magnolia Petroleum Co. Effective in Pettus and Salt Flat on September 29 by Humble Oil & Refining Co. and Gulf Pipe Line Co. Luling and Lytton Springs by Magnolia Petroleum Co. Duval County by Texas Co. Saxet, effective September 29, by

(Continued on Page 135)

TANK WAGON MARKETS

Quotations for gasoline and kerosene in United States, as furnished by the larger marketing concerns, include taxes

November 13, 1934

Taxes

The gasoline quotations given in the following tables include the 1-cen. Federal tax, as well as state, county and city taxes. The gasoline quoted is the regular or standard grade. In most marketing areas a third grade and a premium grade are also available.

Discounts

Under the standard form of commercial consumer contract which went into effect March 1, 1934, save in California, Oregon, Washington, Arizona and Nevada, a discount of 1 cent a gallon off tank wagon or 3 cents a gallon off retail prices is permitted for purchases running between 4,000 and 10,000 gallons a month, or 4 cents a gallon off retail prices for purchases in lots of more than 10,000 gallons a month. The minimum delivery is 25 gallons.

Rocky Mountain District

CONTINENTAL OIL CO.

	Gasoline			Kero.
	Tank wagon	Service station	Incl'ds tax	tank wagon
Denver, Colo...	18 0	20.0	5.0	12.5
Pueblo	18 0	20.0	5.0	11.0
Grand Junction	20.5	22.5	5.0	15.0
Casper, Wyo. ..	18.0	20.0	5.0	11.5
Cheyenne	18.0	20.0	5.0	13.0
Butte, Mont. ..	21.0	23 0	5.0	17.5
Billings	21.0	23.0	6.0	16.5
Helena	23.0	25.0	6.0	17.5
Great Falls ...	21.5	23.5	6.0	17.5
Salt Lake, Utah	19.0	21.0	5.0	16.0
Boise, Idaho ..	22.5	24 5	6.0	18.0
Twin Falls	22.5	24.5	6.0	18.0
Albu'que, N. M.	18.0	20.0	*7.0	13.0

*One-cent city tax.

Effective March 1, 1934, discount to dealers with or without contract throughout Continental territotry: Undivided dealer discount off service station price, 4 cents; divided dealer accounts, 3½ cents.

Standard Oil Co. (Indiana)

	Gasoline			Kero.
	Tank wagon	Service station	Incl'ds tax	tank wagon
Chicago	12.8	12.8	4.0	8.0
Decatur, Ill. ..	14.4	9.9	4.0	10.2
E. St. Louis ...	14.1	11.0	4.0	9.5
Joliet	14.5	16.5	4.0	10.2
Peoria	14.4	10.0	4.0	10.2
Quincy	12.9	14.9	4.0	10.0
Davenport, Ia..	14.2	14.0	4.0	10.1
Des Moines ...	14.1	16.1	4.0	10.1
Mason City ...	14.4	16.4	4.0	10.1
Sioux City	14.3	16.3	4.0	9.7
Duluth, Minn. .	15.0	17.0	4.0	10.4
Mankato	14.7	16.7	4.0	9.5
Minneapolis ...	15.7	13.4	4.0	10.4
LaCrosse, Wis..	15.7	17.7	4.0	10.8
Green Bay	15.9	17.9	5.0	10.2
Milwaukee	14.6	16.6	5 0	9.0
Madison	15.7	16.2	5.0	9.9
Detroit, Mich. .	15.0	17.0	4.0	10.5
Grand Rapids .	14.7	16.7	4.0	10.2
Saginaw	15.0	17.0	4.0	10.5
Evansville, Ind.	12.5	12.5	5.0	10.0
Indianapolis ..	16.1	16.1	5.0	10.2
South Bend ...	16.4	18.4	5.0	9.0
Fargo, N. Dak.	15.7	17.7	4.0	11.4
Huron, S. Dak.	16.2	18.2	5.0	11.4
Sioux Falls ...	15.6	17.6	5.0	10,9
Kans. C., Mo.*	13.6	15.6	4.0	7.5
Springfield	13.3	15.3	4.0	8.8
St. Louis	12.7	12.5	3.5	8.7
St. Joseph* ...	13.6	15.6	4.0	7.8
Wichita, Kans..	13.2	15.2	4.0	7.5
Bartlesville, Ok.	15.7	18.2	5.0	8.5

*State tax 2 cents, 1-cent city tax and 1-cent Federal tax.

Discounts to dealers, effective March 1, 1934: Undivided accounts, 4 cents a gallon on Red Crown Ethyl and Standard Red Crown, divided accounts, 3½ cents a gallon on Red Crown Ethyl and Standard Red Crown.

Stanolex Furnace Oil in Chicago

Effective Nov. 4, 1934, f.o.b. Chicago tank wagon prices: No. 1 (36-40 lt. stw. zero), less than 100 gallons, 8¼ cents; 100-149 gallons, 7¼ cents; 150 gallons or more, 6½ cents; No. 2 (30-34, stw. zero), less than 150 gallons, 7¼ cents; No. 3 (22-26, zero), less than 150 gallons, 7 cents; No. 4 (12-16 zero), less than 400 gallons, 6½ cents; viscosity of No. 4, 85 at 100° F.; No. 5, less than 400 gallons, 5¾ cents. For deliveries of more than stated quantities of Nos. 2, 3, 4 and 5, deduct 1 cent.

Naphtha

	Tank wagon*
Oleum spirits	16.9
1-cent Federal tax.	
V.M.&P. naphtha	13.0
Cleaners' naphtha	13.0
Stanisol	13.0

*Prices include 3-cent Illinois tax, but not Prices f.o.b. Chicago, September 13, 1933. Each of above prices subject to discount of 1 cent per gallon for 150-gallon lots if covered by contracts.

Southern District

STANDARD OIL CO. (KENTUCKY)

	Gasoline			Kero.
	Tank wagon	Service station	Incl'ds tax	tank wagon
Atlanta, Ga. ..	14.5	16.5	7.0	14.5
Augusta	15.5	16.5	7.0	14.5
Macon	16.0	17.0	7.0	14.5
Savannah	17.0	19.0	7.0	14.0
Birm'ham, Ala.	19.0	21.0	8.0	14.0
Mobile	16.0	17.0	8.0	12.0
Montgomery ..	16.5	17.5	8.0	15.0
Jackson, Miss..	17.5	19.5	8.0	13.0
Vicksburg	17.0	18.0	7.0	12.0
Jack'ville, Fla..	18.0	20.0	8.0	11.5
Miami	18.0	20.0	8.0	13.5
Pensacola	15.5	16.5	8.0	13.5
Tampa	18.0	20.0	8.0	12.5
Lexington, Ky..	14.5	15.5	6.0	11.5
Covington	14.0	15.0	6.0	11.5
Louisville . ..	14 5	15.5	6.0	11.0
Paducah	13.0	14.0	6.0	11.0

In addition to the state tax of 4 cents on gasoline, Montgomery has city and county tax of 2 cents on gasoline and one-half cent on kerosene. Kerosene prices in Georgia and Mississippi include 1 cent state tax; in Alabama, an inspection fee of one-half cent on kerosene and one-fortieth cent on gasoline; in Florida an inspection fee of one-eighth cent on kerosene and gasoline. To Pensacola, Mobile and Birmingham state taxes on gasoline add 1 cent city tax.

Southwestern District

MAGNOLIA PETROLEUM CO.

	Gasoline			Kero.
	Tank wagon	Service station	Incl'ds tax	tank wagon
Dallas, Tex. ...	11.0	13.0	5.0	6.0
Fort Worth ...	12.0	14.0	5.0	6.0
Houston	13.0	15.0	5.0	8.5
San Antonio	16.0	18.0	6.0	8.5
El Paso	17.0	19.0	5.0	11.0
Muskogee, Ok...	16.0	18.0	5.0	6.9
Okla. City	15 0	17.0	5.0	7.0
Tulsa	16.0	18.0	5.0	7.5
Ft. Smith, Ark.	14.5	16.5	5.0	8.0
Little Rock ...	17.0	19.0	7.5	9.0
Texarkana	14.0	16.0	5.0	8.0

Atlantic Coast District

STANDARD OIL CO. OF NEW JERSEY

	Gasoline			Kero.
	Tank wagon	Service station	Incl'ds tax	tank wagon
Atl'tic City, N.J.	9.5	12.0	4.0	10.0
Newark	7.4	9.9	4.0	8.5
Annapolis, Md..	12.6	15.6	5.0	10.0
Baltimore	10.5	13.0	5.0	9.5
Cumberland	14.0	17.5	5.0	13.7
Wash'g'n, D. C.	9.0	11.5	3.0	11.5
Danville, Va. ..	15.0	18.5	6.0	13.9
Norfolk	12.2	14.7	6.0	11.3
Petersburg	12.3	14.8	6.0	11.4
Richmond	12.3	14 8	6.0	11.7
Roanoke	13 3	15.8	6.0	12.9
Charls'n, W.Va.	14.0	17.5	5.0	12.6
Parkersburg ..	12.3	15.3	5.0	11.2
Wheeling	14.0	17 5	5.0	12.2
Charlotte, N. C.	17.0	20.5	7 0	13.5
Hickory	15.5	18.0	7.0	13.7
Mt. Airy	17.0	20.0	7.0	13.8
Raleigh	15.5	18.0	7.0	13.3
Salisbury	12.5	15.0	7.0	13.6
Charleston, S.C.	15.2	18.7	7.0	11.3
Columbia	14.9	17.4	7.0	13.2
Spartanburg ..	14.5	17.0	7.0	13.5

Effective October 23, tank wagon gasoline refers to dealer instead of retail prices.

Price basis to dealers: Divided dealers at dealer price, which is 2½ cents above tank car; undivided dealers at regular price less one-half cent. Discount for kerosene, 1 cent off tank wagon price for 25 gallons or more under contract (contract not necessary in Baltimore) except in New Jersey, where no discount is given.

Nebraska

STANDARD OIL CO. OF NEBRASKA

	Gasoline			Kero.
	Tank wagon	Service station	Incl'ds tax	tank wagon
Omaha	15 6	17.4	5.0	10.0
McCook	16.3	17.9	5.0	10.7
Norfolk	16.0	17.9	6.0	10.4
North Platte ..	16.4	18.3	5.0	8.0
Scottsbluff	17.1	18.3	5.0	9.0

Note—Discount to dealers, including any rentals under lease and agency agreements: Undivided accounts, Standard Red Crown and Red Crown Ethyl Gasoline 4 cents. Reliance (third brand) 3 cents, under service station price. Divided accounts, Standard Red Crown Ethyl Gasoline 3½ cents. Reliance (third brand) 2½ cents under service station price. Discounts to consumers covered only by form CD-1, official commercial consumer contract.

Central South District

STANDARD OIL CO. OF LOUISIANA

	Gasoline			Kero.
	Tank wagon	Service station	Incl'ds tax	tank wagon
N. Orleans, La.	11.0	13.5	*7.0	†10.0
Baton Rouge ..	13.7	16.7	6.0	†12.0
Alexandria	14.6	17.6	*7.0	†10.0
Lafayette	15.3	18.8	*7.0	†12.0
Lake Charles ..	14.7	17.7	*7.0	†12.0
Shreveport	13.0	16.5	6.0	†10.0
Knoxville, Tenn.	15.0	17.5	8.0	13.5
Memphis	12.9	15.4	8.0	10.5
Chattanooga ..	13.5	16.0	8.0	11.0
Nashville	12 9	15.4	8.0	12 0
Bristol	12.9	15.4	8.0	14.0

*Includes city tax of 1 cent. †Louisiana kerosene prices include 1-cent state tax.

Effective October 23, tank wagon gasoline refers to dealer instead of retail prices.

Price bases to dealers: Divided dealers at dealer price, which is 2½ cents above tank car; undivided dealers at dealer price less one-half cent.

Pacific Coast Territory

STANDARD OIL CO. OF CALIFORNIA*

	Gasoline			Kero.
	Tank wagon†	Posted retail	Incl'ds tax	tank wagon
San Francisco .	16.5	18.5	4.0	12.5
Los Angeles ..	15.5	17.5	4.0	12.5
Fresno, Calif. ..	17.0	19 0	4.0	14.0
Phoenix, Ariz..	17.0	19.0	6.0	‡16.0
Reno, Nev.	19.0	21.0	5.0	15.5
Portland, Ore. .	19.0	21.0	5.0	13.5
Seattle, Wash..	19.5	21.0	5.0	13.5
Tacoma	19 0	21.0	5.0	13.5
Spokane	22.0	24.0	6.0	18.0

*Retail prices posted by Standard Stations, Inc., a subsidiary.

†Prices are at company's plant or depots, as company does not operate stations. A 4-cent per gallon discount is given dealers and customers taking tank wagon lots except in Phoenix where the discount is 1 cent.

‡Includes 5-cent state tax.

Pennsylvania, Delaware and Part of New England

ATLANTIC REFINING CO.

	Gasoline			Kero.
	Tank wagon	Service station	Incl'ds tax	tank wagon
Philadelphia,Pa.	11.5	11.5	4.0	9.0
Pittsburgh	13.0	14.5	4.0	10.0
Allentown	13.25	15 0	4.0	10.0
Erie	13.25	15.0	4.0	9.0
Scranton	13 25	15.0	4.0	10.0
Altoona	13.25	15.0	4.0	10.0
Dover, Del. ...	13 25	15.0	4.0	10.0
Wilmington ...	13.25	15 0	4.0	9.0
Springf'd, Mass	14.5	16.5	4.0	7.5
Worces.er	14.5	16.5	4.0	8.5
Hartford, Conn.	13.5	15.5	3.0	7.5
New Haven ...	13.5	15.5	3.0	7.5
Providence, R.I.	13.0	15.0	3.0	7.5

Note—Tank wagon prices are those applicable to consumers purchasing lots of 100 or more gallons in one delivery.

New York and New England

SOCONY-VACUUM CO., INC.

	Gasoline			Kero.
	Tank wagon	Service station	Incl'ds tax	tank wagon
Albany, N. Y..	15.5	16.5	4.0	8.5
Met. New York	16.0	17.0	4.0	8.5
Brooklyn, Bronx, Queens, Nassau	15.0	16.0	4.0	8.0
Buffalo	12.5	13.0	4.0	9.0
Rochester	14.0	15.0	4.0	8.5
Syracuse	16.0	17.0	4.0	8.75
Boston, Mass. .	15.0	16.0	4.0	7.5
Portland, Me. .	17.0	18.0	5.0	8.75
Manch't'r, N.H.	16.0	17.0	5.0	9.0
Burlington, Vt.	18.5	19.5	5.0	9.0

Ohio

STANDARD OIL CO. OF OHIO

	Gasoline			Kero.
	Tank wagon	Service station	Incl'ds tax	tank wagon
Ohio points	15.0	17.0	5.0	*12.5

*Includes state tax of 1 cent, effective July 12.

Canada*

IMPERIAL OIL, LTD.

Imperial 3-Star Gasoline

	Gasoline			Kero.
	Tank wagon	Service station	Incl'ds tax	tank wagon
Hamilton Ont..	†21.0	23.5	6.0	17.5
Toronto, Ont...	†21.0	23.5	6.0	17.5
Brandon, Man..	30.3	33.3	7.0	21.8
Winnipeg, Man.	28.7	31.7	7.0	20.2
Regina, Sask..	29.0	32.0	6.0	21.5
Saskatoon, Sask.	31.8	34.8	6.0	24.3
Edmonton, Alta.	31.2	34.2	6.0	23.7
Calgary, Alta..	28.5	31.5	6.0	21.0
Vancouver, B.C.	27.0	30.0	7.0	24.0
Montreal, Que..	24.0	27.0	6.0	17.0
St. John, N.B..	26.0	30.0	8.0	21.0
Halifax, N. S. .	26.0	30.0	8.0	21.0

*Imperial gallon used in Canada. †Governed by service station price.

Maritime provinces, all dealers 4 cents off service station price. All other provinces open dealers 2.5 cents off service station price and 1 cent additional to 100 per cent accounts.

Retail Price Changes

Regular-Grade Gasoline and Kerosene

Standard Oil Co. (Indiana), November 7, advanced station gasoline 1.1 cents in East St. Louis.

Standard Oil Co. (Indiana), November 13, advanced tank wagon and station gasoline .3 cent throughout its territory. (Prices in table do not include this change.)

Atlantic Refining Co., November 5, advanced tank wagon gasoline .75 cents and station gasoline 2 cents in Pittsburgh; November 7, reduced tank wagon gasoline .5 cent and station gasoline 1 cent; November 9, advanced tank wagon gasoline .5 cent and station gasoline 1 cent, November 6, advanced tank wagon gasoline 3.5 cents and station gasoline 5 cents in Springfield; advanced tank wagon gasoline 2 cents and station gasoline 3.5 cents in Worcester; advanced tank wagon gasoline 1.25 cents and station gasoline 2.5 cents in Hartford; advanced tank wagon gasoline 1 cent and station gasoline 2 cents in New Haven; advanced tank wagon gasoline 2 cents and station gasoline 3.5 cents in Providence.

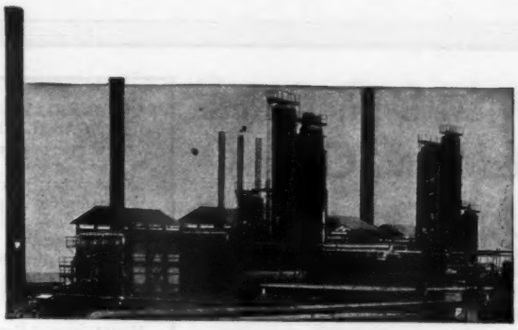
Socony-Vacuum Oil Co., Inc., November 3, advanced tank wagon gasoline 1 cent in Metropolitan New York. November 6, advanced tank wagon gasoline 2 cents and station gasoline 3 cents in Albany; reduced station gasoline 1 cent in Brooklyn. November 6, reduced tank wagon gasoline .5 cent and advanced station gasoline .5 cent in Buffalo; November 8, reduced tank wagon gasoline 3.5 cents and station gasoline 4 cents. November 6, advanced tank wagon gasoline 2.5 cents and station gasoline 3.5 cents in Rochester; November 8, reduced tank wagon and station gasoline 2 cents. November 6, reduced tank wagon gasoline .5 cent and advanced station gasoline .5 cent in Syracuse. November 6, advanced tank wagon gasoline 1.5 cents and station gasoline 2.5 cents in Manchester. October 22, reduced tank wagon kerosene .5 cent in Syracuse. October 29, reduced tank wagon kerosene 1 cent in Boston. October 29, advanced tank wagon kerosene .25 cent in Burlington. October 31, reduced tank wagon kerosene .5 cent in Brooklyn.

Standard Oil Co. of Louisiana, October 16, reduced tank wagon and station gasoline 1 cent in New Orleans; October 31, reduced tank wagon kerosene 2 cents. October 26, reduced tank wagon

(Continued on Page 138)

CANADIAN GASOLINE IMPORTS

OTTAWA, Canada, Nov. 10.—Official figures show that Canada in July imported 4,338,961 gallons of casinghead gasoline worth $138,393, compared with 6,907,986 gallons worth $399,436 in June. Receipts of gasoline lighter than .8235 specific gravity were 718,505 gallons valued at $77,539 in July, compared with 1,443,502 gallons worth $151,652 in June.



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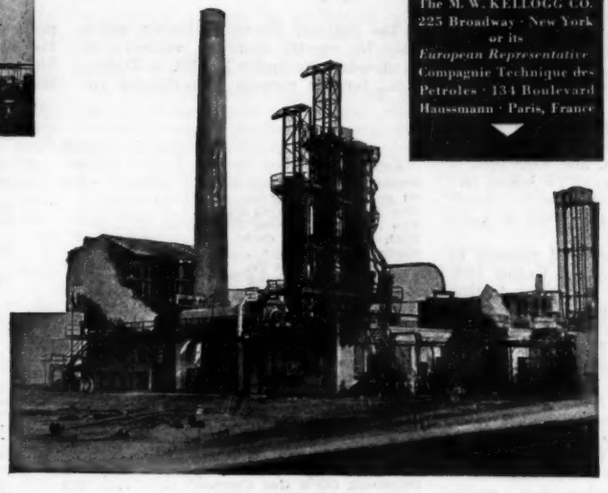

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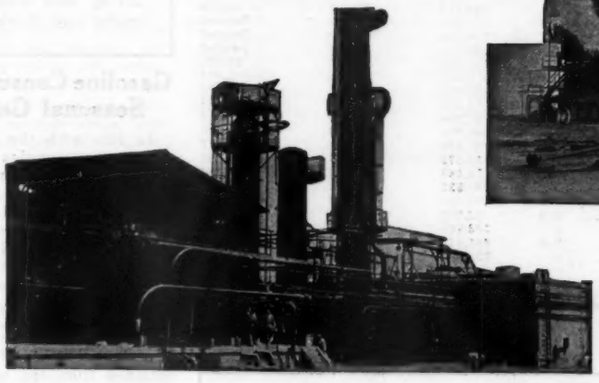

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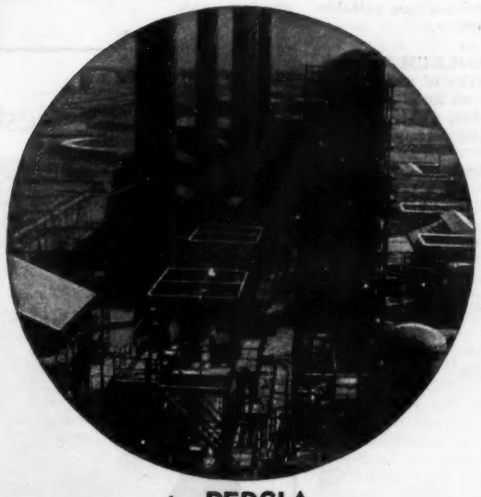


in PERSIA

CRACKING VARIOUS CRUDES

Refineries in many parts of the world are operating under the broad licensing rights of Gasoline Products Company.

These rights permit the designing of combination units incorporating one or more of the outstanding features of the Cross, de Florez, Holmes-Manley and Tube and Tank processes. Thus the refiner is assured of a cracking unit adapted to his particular requirements.

We suggest you investigate the broad and comprehensive service of Gasoline Products Company before investing in cracking equipment.

GASOLINE PRODUCTS COMPANY

INCORPORATED

GASOLINE PRODUCTS CO. INC.

11 COMMERCE STREET · NEWARK, NEW JERSEY

NEWS FOR SALES DEPARTMENTS

Gasoline Burning Appliances Offer Sizable Fuel Market

The steady growth of the gasoline-pressure appliance industry has created a sizeable and worthwhile market of 338,000,000 gallons of gasoline annually. There are in use today some 3,540,000 lamps and lanterns, 763,000 cook stoves, 305,000 radiant heaters and about 1,120,000 irons, all operating on the gasoline-pressure principle.

Approximately 13,000,000, or 45 per cent of the homes in the United States are not piped for gas, and 8,000,000, or 28 per cent of this country's homes lack electricity. Gasoline-pressure appliances are supplying the needs of many of these homes.

These facts were revealed recently by a survey completed by the United Laboratories of Wichita, Kans., an institution sponsored by five manufacturers of gasoline-pressure appliances. One of the duties of this laboratory is to test various grades of gasolines and to determine their suitability as appliance fuel. Straightrun gasoline, free from any lead or lubricating compounds, is the satisfactory fuel for these appliances. Gasolines treated with various compounds tend to clog and gum the generators.

In ignoring this market, it is possible that many jobbers are losing a considerable gallonage, especially in districts where gas is not obtainable. As octane rating is no factor in the utility of the fuel in this case, it may serve as an outlet for low-octane gasolines not suitable for motor car consumption.

SEPTEMBER PETROLEUM TRADE

The following statistics of exports and imports of petroleum and its products for the month of September, 1934, are furnished by the U. S. Department of Commerce:

Exports

	Bbls.
Petroleum, crude	4,068,147
Natural gasoline	106,810
Gasoline and naphtha	1,676,579
Illuminating oil	788,955
Gas and fuel oils	3,079,328
Lubricating oil	627,498
	Pounds
Lubricating greases	8,107,186
Paraffin wax, unrefined	9,435,349
Paraffin wax, refined	11,817,542
	Tons
Petroleum asphalt	15,053
Petroleum coke	5,743

Imports

	Bbls.
Petroleum, crude	3,731,064
Fuel oil	540,113
Unfinished dist.	.....
Gas oil	193
Paraffin oil	.....
Liquid derivatives	2,946
Gasoline	159
Finished light products	.....
Naphtha	.....
Illuminating oil	1,200
Lubricating oils	792
Paraffin wax (pounds)	2,404,385

SELLING RULE INTERPRETED

Due to the confusion and apparent contradiction between the orders of May 26 and February 1, 1934, the Planning and Coordination Committee announces the following clarification:

Whereas, it appears that there is some apparent contradiction in the two orders which has resulted in considerable confusion in the industry as to whether the said interpretation of February 1, 1934, was superseded by the said order of May 26.

Now, therefore, in order to clarify this situation, it is hereby declared that the said interpretation of February 1, 1934, was not superseded by the said order of May 26, but remained, and is in full force and effect, and, in so far as it is applicable to marketing operations within the industry, is a limitation upon the said order of May 26, 1934.

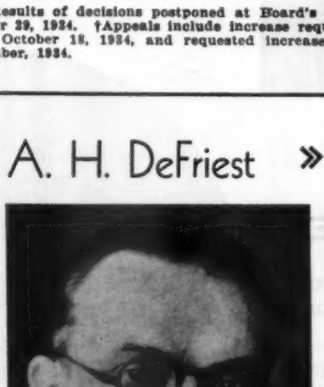
Refinery Board of Review Denies Nine Appeals for Increased Nov. Quotas

The Refinery Board of Review, which held its regular monthly session on Wednesday, November 7, 1934, in Dallas, Tex., for the purpose of reviewing appeals from the decisions of the allocating authorities fixing November gasoline production quotas, reported the following appeals and decisions rendered:

Appellant	Dist. No.	Fixed quota (bbls.)	Increase requested (bbls.)	Decision
Sinclair Refining Co.*	5-A	54,450	15,500	+ 15,500
El Dorado Refining Co.	4	.....	.....	Withdrawn
The Atlantic Refining Co.†	1	940,000	140,000	Denied
The Atlantic Refining Co.†	2	146,520	23,480	Denied
Utah Oil Refining Co.*	7	82,500	30,667	+ 30,667
Skelly Oil Company*	4	311,934	40,000	+ 40,000
Waverly Oil Works Co.	2	6,059	741	+ 741
The National Refining Co.	3	30,192	19,808	+ 19,808
Continental Oil Company	1	115,000	18,175	Denied
Continental Oil Company	4	270,000	40,589	Denied
Continental Oil Company	5-A	82,929	4,525	Denied
Lincoln Oil Refining Co.	3	135,230	16,075	+ 16,075
Daugherty Refinery	2	7,029	1,971	+ 1,971
Rio Grande Oil Company	8	48,409	19,091	+ 9,000
The Bradford Oil Refining Co.	2	11,583	1,471	Denied
The Pennsoil Company	2	91,684	16,316	+ 9,133
Cities Service Company	1	306,000	65,000	+ 46,000
Marathon Oil Company	3	31,829	2,171	+ 2,171
Marathon Oil Company	5-A	52,272	4,528	+ 3,728
Chalmette Petroleum Corp.	6-A	53,083	21,917	Denied
Shell Petroleum Corporation	2	789,532	63,334	Denied
Crown Central Petroleum Corp.	5-B	100,000	49,420	+ 8,750
Shamrock Oil & Gas Company	5-A	32,700	4,300	Denied
The Pure Oil Company	2	133,803	14,197	+ 14,197
The Pure Oil Company	5-B	381,674	8,326	+ 8,326
Mid-Continent Petroleum Corp.	4	322,493	152,507	+138,317

*Results of decisions postponed at Board's special session held in Washington, D. C., October 29, 1934. †Appeals include increase requested under the Oil Administrator's Order dated October 18, 1934, and requested increase over allocating agency's quota fixed for November, 1934.

A. H. DeFriest » » »



IN THE eastern part of New York State there is a very old town called DeFriestville. About 1633, under a Dutch land grant, it was settled by a family of DeFriests, the descendants of whom have, for the most part, remained within a stone's throw of the old homestead. However, A. H. DeFriest proved to be an exception to the family custom and chose to work in many foreign fields. It was after this that he settled in Los Angeles, Calif., as vice president in charge of sales and a director of General Petroleum Corporation of California, a subsidiary of the Socony-Vacuum Corporation.

Reared in Albany and Schenectady, Mr. DeFriest attended Coalgate University at Hamilton, N. Y. He launched his business career as traveling salesman in the Middle West, but when the United States entered the World War he enlisted in the army and was made a second lieutenant in field artillery. The lure of foreign service remained with him after the war and he joined the foreign division of the Standard Oil Company of New York. After an intensive preparatory program, Mr. DeFriest departed for the Orient where he held a series of positions in Formosa, Japan, South China, and the Philippines. From a position in the management of the company's activities in the Philippines, he returned to the United States for work with other subsidiaries of the organization. Then in 1932 he was sent to Yokohama as assistant general manager of Socony-Vacuum for Japan, Korea and Formosa. In December, 1933, he was called back to California, and early in 1934 his appointment as vice president in charge of sales and his election as a director of the General Petroleum Corporation was announced.

OCTOBER PRICE WARS SEND GASOLINE TO 1934 LOW

General price-cutting activities in the Eastern, Middle Western and Southern districts during October resulted in a decrease of 1.79 cents in the average service station price of gasoline in 50 representative cities in the United States. The average price November 1 was 11.79 cents excluding taxes. Stability continued in the Rocky Mountain and Pacific areas. Prices including taxes, November 1, ranged from 9.9 cents in Newark, N. J., to 24.5 cents in Boise, Idaho. The average is considerably below the November 1, 1933, figure of 14.30 cents, most of the decrease having been effected during September and October.

Gasoline Consumption Shows Seasonal Gain for August

In line with the trend to high midsummer consumption of gasoline in the United States, August figures show a gain of 2.85 per cent over July. This upward swing to 1,581,656,000 gallons followed a slight decline from the June total. The average daily consumption in August, 1933, was 49,357,000 gallons, 1,664,000 gallons less than this year's comparative figure. California reported the greatest gain in gallonage after several months of declining consumption. The figures in the following table were obtained from tax statistics.

	Month of July, 1934	Month of Aug., 1934
Alabama	13,272,000	13,737,000
Arizona	5,882,000	6,110,000
Arkansas	12,626,000	12,929,000
California	102,628,000	113,863,000
Colorado	17,445,000	14,164,000
Connecticut	26,008,000	26,205,000
Delaware	4,144,000	4,352,000
Dist. of Columbia	9,139,000	10,386,000
Florida	17,058,000	17,341,000
Georgia	30,731,000	31,626,000
Idaho	7,012,000	7,385,000
Illinois	96,340,000	99,589,000
Indiana	42,109,000	42,876,000
Iowa	34,897,000	36,453,000
Kansas	27,573,000	35,000,000
Kentucky	16,778,000	18,168,000
Louisiana	15,250,000	15,626,000
Maine	13,964,000	15,434,000
Maryland	19,529,000	19,840,000
Massachusetts	58,904,000	61,445,000
Michigan	76,235,000	76,232,000
Minnesota	42,520,000	43,695,000
Mississippi	10,885,000	11,499,000
Missouri	44,292,000	44,863,000
Montana	9,530,000	9,959,000
Nebraska	21,036,000	20,662,000
Nevada	2,424,000	2,163,000
New Hampshire	5,231,000	5,366,000
New Jersey	71,716,000	70,934,000
New Mexico	5,244,000	5,691,000
New York	156,487,000	160,093,000
North Carolina	23,765,000	25,979,000
North Dakota	9,873,000	10,784,000
Ohio	86,918,000	91,328,000
Oklahoma	27,534,000	26,026,000
Oregon	15,838,000	16,805,000
Pennsylvania	106,740,000	110,521,000
Rhode Island	11,681,000	11,176,000
South Carolina	11,238,000	11,515,000
South Dakota	10,396,000	9,680,000
Tennessee	16,899,000	19,334,000
Texas	75,574,000	77,454,000
Utah	6,598,000	6,638,000
Vermont	5,523,000	6,399,000
Virginia	22,743,000	24,778,000
Washington	26,319,000	24,833,000
West Virginia	13,267,000	14,411,000
Wisconsin	42,289,000	42,053,000
Wyoming	5,050,000	4,916,000
Total	1,537,864,000	1,581,656,000
Daily average	49,609,000	51,021,000
Change from previous year:		
Total increase	.....	51,593,000
Percentage increase in daily avg.	.....	+3.37%

OIL COMPANIES REBUILD

BOW ISLAND, Alberta, Nov. 10.—Imperial Oil, Ltd., and the British-American Oil Co. have rebuilt their local storage and distribution plants.

NATURAL GASOLINE MANUFACTURE

Good Blending Important for Gasoline Mixtures

Blends of natural gasoline with refinery gasoline, when the proportions and qualities of the ingredients are carefully selected, are highly desirable motor fuels possessing the premium characteristics of "high test" gasolines, according to the "Natural Gasser," published by the Warren Petroleum Co. Unlike the antiknock appeal in premium gasolines, the "high test" appeal is applicable to all motorists. Practically every motor car responds to the improved volatility characteristics incorporated in "high test" gasolines. Additionally, by careful selection of blending stocks, the antiknock ratings of these blends can be maintained at a value sufficiently high to provide satisfactory performance in all the cars on the road.

Advantages of motor natural gasolines not so perceptible to the motorist, are improved accelerating ability and reduction in carbon deposition.

In those instances, and there have been many, where natural gasoline blends have proven unsatisfactory, one or both of two factors account for the failure.

1. Use of an inferior refinery product (from the motor fuel viewpoint), such as kerosene or a too heavy naphtha.
2. Use of a natural gasoline with too high a vapor pressure for the proportion used and the season and point of consumption.

Blending natural gasolines with refinery gasolines is done primarily to improve the volatility characteristics of the product marketed. Hence, the chief specifications to observe in a blending program are those relating to the volatility of the finished product. Primarily, the volatility as expressed by the first half of the distillation curve is the important consideration.

There are many specifications which could be selected to control the blending operation. However, experience has shown that an exceedingly convenient choice is a Reid vapor pressure specification to measure the intensity of the volatility combined with a specification for the per cent evaporated at 212° F. at the A.S.T.M. distillation as a measure of the extent of the volatility. The useful factor is the latter as it is a measure of the improved performance characteristics of the gasoline. It should, therefore, be expressed as a minimum specification. The intensity factor, or Reid vapor pressure, on the other hand, is used to safeguard against having the volatility of the gasoline at so high a level as to cause lack of control of the gasoline in conventional automobile fuel systems. It should, therefore, be expressed as a maximum specification.

This discussion would not be complete without some mention of evaporation losses. The bulk station should be equipped to reduce these losses to a minimum. Some of the cheapest and easiest expedients are as follows:

1. Paint tanks a light color.
2. Provide tanks with reliable vacuum and pressure relief valves, the setting to be determined by the strength of the tank.
3. Inspect thoroughly for leaks in vapor space with soap suds, preferably on hot sunshiny afternoons.
4. Old and unused lines should be disconnected at the tank and the openings tightly plugged. Manhole covers should be carefully inspected as to condition of gaskets and tightness of bolts.
5. Gauge and thief hatches should be tightly closed when in actual use.
6. Gasoline should always enter below the liquid level.

Growing September Demand Cuts Natural Gasoline Stocks as Production Increases

The production of natural gasoline continued its upward trend in September, when the daily average output was 4,260,000 gallons. This represents a gain of 150,000 gallons over the production in August. In general, the largest gains in September were recorded in the leading producing areas, namely, the Panhandle, Kettleman Hills, and Oklahoma City. Movement was especially pronounced in Texas where stocks diminished 3,879,000 gallons and production increased 1,400,000 gallons, making a total consumption of 5,279,000 gallons from that area, excluding losses.

The daily average output in the Texas Panhandle, 783,000 gallons, constituted a new record for that area, while the stock figure continues to decrease from the record June total. In East Texas a slight but notable decrease in production occurred together with a stock gain. This is the first monthly decline in the East Texas production for the year.

In California, where the influence of seasonal demand is at a minimum, production of natural gasoline decreased and stocks accumulated during September. An added output of over 500,000 gallons in the prolific Kettleman Hills area failed to make up for the diminishing production from other fields of the State.

Apparently, an early seasonal movement to stock or blend natural gasoline at refineries, especially in the Mid-Continent, has exceeded the anticipated production, resulting in a much healthier situation than could be foreseen from the June figures. This points to a favorable outlook in the natural gasoline industry for the fall market.

PRODUCTION AND STOCKS BY FIELDS

(Thousands of gallons)

	Production				Stocks end of month		Sept., 1934	
	Sept., 1934	Aug., 1934	Jan.-Sept., 1934	Jan.-Sept., 1933	Sept., 1934	Aug., 1934	Used at refineries	Naphtha purch'd for blending
East Coast	.....	.....	.....	.....	.....	.....	3,864	....
Appalachian	3,100	2,900	38,700	40,200	2,985	3,754	840	182
Ill., Ky., Mich.	600	600	5,700	6,000	252	238	8,946	12
Oklahoma	28,500	28,300	263,500	264,900	21,964	26,254	18,270	150
Oklahoma City	8,000	7,500	75,200	67,800	8,747	8,844	(*)	5
Osage County	4,000	3,000	32,400	30,600	3,384	5,248	(*)	66
Seminole	6,300	7,000	63,600	33,300	5,110	6,901	(*)	8
Rest of State	10,200	9,900	92,200	83,200	4,723	5,261	(*)	71
Kansas	2,300	2,100	19,400	18,000	2,009	1,948	5,838	..
Texas	41,500	40,100	333,600	265,600	23,046	26,905	22,680	953
East Texas	4,900	5,100	32,100	14,200	550	536	(*)	953
North Texas	1,500	1,500	15,200	13,800	596	816	(*)	..
Panhandle	23,500	21,400	181,000	129,700	17,718	20,616	(*)	.
West Central	6,600	6,800	64,000	57,900	2,591	3,169	(*)	..
Rest of State	5,000	5,300	41,300	45,000	1,591	1,768	(*)	..
Louisiana	3,400	3,200	30,200	27,800	1,436	2,967	2,268	..
Arkansas	1,100	1,100	9,700	11,600	148	170	1,260	419
Rocky Mountain	4,800	4,900	42,700	40,300	1,197	1,231	2,730	22
California	42,600	44,100	370,800	369,000	3,393	3,277	34,524	(*)
Huntington Bh.	3,400	3,600	29,100	16,500	(*)	(*)	(*)	(*)
Kettleman Hills	14,500	13,900	110,600	94,700	(*)	(*)	(*)	(*)
Long Beach	6,200	6,500	57,100	69,200	(*)	(*)	(*)	(*)
Santa Fe Spgs.	4,800	5,200	46,800	63,000	(*)	(*)	(*)	(*)
Ventura Avenue	3,300	3,500	32,200	33,000	(*)	(*)	(*)	(*)
Rest of State	10,400	11,400	95,000	92,600	(*)	(*)	(*)	(*)
Total	127,900	127,300	1,114,300	1,043,400	56,520	66,744	101,220	1,738
Daily average	4,260	4,110	4,080	3,820	.....	.....	3,374	58
Total (thousands of bbls.)	3,046	3,031	26,531	24,843	1,346	1,589	2,410	41
Daily average	102	98	97	91	.....	.....	80	1

*Not available.

PRODUCTION AND DISTRIBUTION OF NATURAL GASOLINE

(Thousands of barrels of 42 gallons)

	Sept., 1934		Aug., 1934		Jan.-Sept., 1934	Jan.-Sept., 1933
	Total	Daily av.	Total	Daily av.		
Production	3,046	102	3,031	98	26,531	24,843
Decrease in all stocks	179	6	....	..	.....	.....
Total	3,225	108	3,031	98	26,531	24,843
Blended at refineries	2,324	77	1,973	63	17,818	16,891
Run through pipe lines in Calif.	81	3	81	3	985	928
Jobbers, exports, etc.	584	29	525	17	3,901	3,985
Increase in all stocks	....	..	239	8	931	339
Losses	236	8	213	7	2,896	2,700
Total	3,225	108	3,031	98	26,531	24,843

PRODUCTION OF MOTOR FUEL

(Thousands of barrels of 42 gallons)

	Sept., 1934		Aug., 1934		Jan.-Sept., 1934	Jan.-Sept., 1933
	Total	Daily av.	Total	Daily av.		
Refinery gasoline:						
Straightrun	16,545	522	18,226	588	156,120	148,389
Cracked	15,492	516	16,965	547	134,567	134,977
Natural gasoline:						
Production	3,046	102	3,031	98	26,531	24,843
Deduct losses	236	8	213	7	2,896	2,700
Benzol	109	4	115	4	1,251	1,003
Total motor fuel	34,956	1,166	38,124	1,230	315,573	306,512

July Increase Reported in Canadian Gasoline Sales

OTTAWA, Canada, Nov. 10.—Official figures covering Canadian gasoline sales in July have been compiled by the Federal Department of Trade and Commerce from the returns of provincial gasoline tax departments. Figures from Saskatchewan are not available but returns from all other provinces show increased sales compared with July, 1933.

In Prince Edward Island, sales in July were up from 340,000 gallons in 1933 to 367,000 gallons in 1934; while for the seven-month period the total is unchanged to 1,220,000 gallons. In Nova Scotia July sales increased from 2,280,000 to 2,529,000 gallons; and for the seven-month period from 9,540,000 to 9,779,000 gallons. New Brunswick sales in July were up from 1,757,000 to 1,981,000 gallons; and for the seven months they increased from 5,979,000 to 6,128,000 gallons. In Quebec the July figures were 10,555,000 gallons in 1933 and 11,643,000 in July, 1934; and for the seven months the total went up from 45,975,000 to 47,274,000 gallons.

CODE ORDER REVISION PLANNED

The Emergency National Committee for the liquefied gas industry has submitted an application to the National Industrial Recovery Board for the suspension of the exemption conferred in Paragraph 3 of the Administrative Order No. X-36, dated May 26, 1934, whereby members of its industry whose principal line of business is embraced in a trade or industry subject to a code other than the code for the above industry were exempted from obligation to contribute to the expense of code administration for the above industry.

Notice is hereby given that any criticisms of, objections to, or suggestions concerning said application for suspension of said exemption must be submitted to Deputy Administrator Frank A. Hecht, 1320 G Street, N.W., Washington, D. C., prior to Wednesday, November 21, 1934, that it may be revised on the basis of these opinions.

LEAMINGTON GAS AGREEMENT

LEAMINGTON, Ontario, Nov. 10.—The Southern Ontario Gas Co. has submitted to the town council a contract covering the supplying of purified natural gas. If the agreement is accepted a new transmission line from Glenwood to Leamington will be undertaken next spring, at an estimated cost of $65,000, and natural gas free of sulphur will be delivered within 12 months. The contract stipulates a rate of 36 cents per 1,000 feet for unpurified gas and thereafter a price of 41 cents per 1,000 feet for purified gas. At present the rate for unpurified gas is 38 cents. The town handles the distribution and the rate to the consumer will remain unchanged at 55 cents. The agreement may be submitted to vote of the ratepayers at the municipal elections.

CHEMICAL PLANT BUYS GAS

Franklin Tool Co., of Mount Pleasant, Mich., is nearing completion of a 14-mile line of 6-inch pipe for the Apex Gasoline Co.'s new plant in Porter Township, Midland County, Michigan, to the Dow Chemical Co. plant at Midland, Mich.

The Apex company is under contract to supply the Dow company with 10,000,000 cubic feet of residue gas daily. Natural gasoline will be marketed through the Roosevelt Oil Co. of Mount Pleasant, Mich.

Jene Harper, of the Franklin Tool Co., is in charge of the pipe line construction.

NEWS FOR PETROLEUM REFINERS

Unbalanced Highway System Discussed

DALLAS, Texas, Nov. 15.—Ascribing high gasoline taxes to billions spent for unnecessarily costly roads J. E. Pennybacker, managing director of the Asphalt Institute, told the petroleum industry that the best way for it to substitute continuing prosperity for a "prince and pauper" reputation would be to achieve tax reductions and sales increases via a balanced highway program.

Mr. Pennybacker pointed out, in an address before the American Petroleum Institute, that such a policy would not only protect the interest of 24,000,000 motor car users but it would sell more gasoline because "it doesn't take an Einstein to prove that making an all weather road grow where mud and dust were the only previous crop induces motor vehicle operation. It doesn't take a secret service operative to find out why a suburbanite's car stays in the garage when the boulevards are jammed."

The speaker emphasized that extravagant sums spent for boulevards between cities, or paralleling railroad tracks, had resulted in a situation whereby there are too many roads where they are not needed and not enough where they are needed. He mentioned the fact that farmers, of whom only 16 per cent are on all weather roads should not have to await the completion of trunk lines.

Mr. Pennybacker cited four economic facts as responsible for unbalanced highway programs and high gasoline taxes: First, development of interurban traffic largely to the neglect of country roads; second, highway building with small regard to the relationship between investment and return as compared with the prudence of industrialists who built factories only after a study of markets; third, the digging up and throwing away of rough and pot-holed macadam and gravel surfaces when a smooth pavement could easily have been imposed upon the traffic-compacted bases; fourth, the building of pavements at great expense from materials hauled by rail long distances when wholly suitable rock or gravel literally lay alongside the right of way.

"Nothing is more important to the petroleum industry," stated Mr. Pennybacker, "than to assure on the one hand an equitable gasoline tax and on the other hand a highway program of maximum efficiency—for if a bad tax condition drains your life blood—an inadequate highway program keeps you from life blood to replace it.

"A careful study of State and Federal traffic surveys in recent years established beyond question that not more than three per cent of all our highways carry a traffic in excess of 1,500 vehicles a day. This figure represents the minimum point at which leading engineers and economists declare a high type pavement is warranted. This figure moreover is that at which the traffic will return in gasoline and motor taxes an annual revenue sufficient to pay for maintenance, interest on first cost and a conservative annual amortization.

"With a total length of more than 3,000,000 miles our indicated need for trunk line pavements is not over 100,000 miles—yet we have actually built 50,000 more miles than we need. Therefore, I suggest that the petroleum industry's relief from throttling taxation lies in the establishment and rigid maintenance of a highway program under which every highway project shall cost no more than the capitalized annual return in benefits to those who use it."

Asphalt Use on Secondary Highways to Be Subject at National Road Oil Meet

Oil men will meet with highway engineers, legislators and contractors at the fourth annual National Road Oil Congress in Tulsa, November 22 and 23, according to W. B. Way, general manager of the International Petroleum Exposition and chairman of the executive committee of the congress.

"The National Road Oil Congress hopes to interest the oil industry in highway construction for two purposes," said Mr. Way.

"First, because asphalt or bituminous highway surfacing, made from petroleum, has been proved a good hard-surfaced, all-weather and dust-free road of low initial and maintenance cost and is fast becoming the accepted type of highway for the secondary system over the country. This provides another use for oil.

"And second, because the use of this kind of highway is probably the best way to counteract the excessive gasoline tax. Economic use of the tax dollar opens the door to tax reduction. Gas taxes can't be lowered by mere opposition. The nation-wide cry for more miles of mudless and dustless roads can only be answered by construction of the roads.

"If the oil industry can and will point the way to a more economic use of the highway dollar, to the end that more miles of wholly practical roads can be constructed for less money than is now being used, we will open the door to tax reduction by a practical and effective answer to the demand for excessive taxes.

"The educational program presented by the National Road Oil Congress is the key to this door. Highway engineers of the 48 states, contractors, legislators and others whose duties and interests have to do with roads have been invited. A program including a representative of the U. S. Bureau of Public Roads, a speaker from the American Petroleum Institute, several highway engineers of states which have successfully used bituminous or black top highways, and several road building machinery executives, has been arranged for the two-day session.

"Figures compiled by the Road Oil Congress from 28 states, including two answering the questionnaire which said they would not use any, show that an average of over seven million gallons of road oil will be used by each of the states this year. This is an increase of between one and two million gallons over the preceding year for each state."

George J. Stein, of Miami, Okla., is president of the congress; E. Bee Guthrey, highway commissioner of the Tulsa Chamber of Commerce, is secretary; W. B. Way, general manager of the International Petroleum Exposition, is chairman of the executive committee; committee members are C. E. Buchner of the Independent Petroleum Association of America; Reid McBeth, oil industries secretary of the Tulsa Chamber of Commerce; Emby Kaye, vice president in charge of refineries for the Skelly Oil Co.; D. H. Foster, Mid-Continent Petroleum Corp.; A. V. Bourque, of the Western Petroleum Refiners Association, and Stoner McClelland, former county highway engineer of Tulsa County, Oklahoma.

PROGRAM FOURTH ANNUAL NATIONAL ROAD OIL CONGRESS, HOTEL TULSA, TULSA, OKLA.

November 22-23, 1934

Thursday

10:00 A.M. Report by Secretary on Work of Preceding Congresses and Accomplishments to Date, E. Bee Guthrey, Tulsa.
"The Relationship Between Tax Costs and Road Costs," by C. S. Lee, American Petroleum Institute.

1:30 P.M. "Oil Roads in Utah," by E. C. Knowlton, Assistant Chief Engineer of the Highway Department of the State of Utah, Salt Lake City, Utah.
"Road Oil (Asphalt) Construction by Travel Plant Method," by F. D. Hooper, Barber-Greene Co., Aurora, Ill.

6:30 P.M. Entertainment and smoker.

Friday

9:00 A.M. Motion picture and talk of "Improved Construction of Asphalt Roads," by A. C. Rerick, Etnyre Co., Oregon, Ill.
"The Place of Low-Cost Construction in a Highway System," by C. E. Swain, Fort Worth, Tex., District Engineer of U. S. Bureau of Public Roads.
"Improved Mix in Black Top Construction," by Kenneth Lindsay, Iowa Manufacturing Co., Cedar Rapids, Iowa.

12:00 Noon Luncheon at Chamber of Commerce and radio address over KVOO by Governor-elect of Oklahoma.

2:00 P.M. "Farm-to-market and Feeder Roads of Low Initial Cost, All-weather, Dust-free, and Low Maintenance Cost Nature," by H. D. Barnes, State Highway Engineer of Kansas, Topeka, Kans.
Motion picture: "Bituminous Highway Construction in Kansas," Ford Bacon, Skelly Oil Co.
"The Ingall Oil-Asphalt Road Building Machine" (an improved method of bituminous construction), by H. A. Ingall, Bakersfield, Calif.
Open Forum. Questions from floor will be answered and discussed by the engineers and authors of papers at the Congress.

FUEL OIL REGULATIONS

WINNIPEG, Manitoba, Nov. 10.—Following the death of three persons in an oil furnace explosion at Fort Gary, strict regulations governing the installation and servicing of oil furnaces have been adopted by the Manitoba provincial government. Fuel oil companies will be required to take out licenses and must deposit with the provincial public works department a $2,000 bond guaranteeing compliance with all regulations. Fuel oil will be subject to strict tests before delivery, and oil-burning equipment must be approved by the National Research Council of Canada. Men who install oil furnaces must first pass examinations as to qualification for the work. Heavy penalties are laid down for failure to comply with the regulations.

Lion Acquires Ownership of Two East Texas Refineries

J. D. Wrather, owner of the Overton Refining Co. of Overton, and the Kilgore Refining Co. of Kilgore, has announced the sale of these East Texas refineries to the Lion Oil Refining Co., of El Dorado, Arkansas. Included in the sale are 71 producing wells in the East Texas field and 350 acres of leases, comprising the remainder of Mr. Wrather's holdings in that field. In addition, the purchaser has acquired 30 other wells which were connected to the two named refineries.

The Lion Oil Refining Co. comprises a complete organization, producing, transporting, refining and marketing petroleum products in four states. The 12,000-bbl. refinery located at El Dorado has facilities for skimming, cracking and manufacturing lubricating oil and asphalt.

The two East Texas refineries, each rated at 3,000 bbls. daily crude capacity are also equipped with cracking units and are served by pipe line from wells in their respective areas. Both plants have been shut down since the latter part of October.

Egloff to Conduct Lecture Series on Oil Refining

Dr. Gustav Egloff, Director of Research of the Universal Oil Products Co., is scheduled to deliver a series of lectures before five local sections of the American Chemical Society. The program of the series follows:

November 26, University of Kentucky, Lexington, Ky.—"Modern Refining and Products From Crude Oil."

November 27, Vanderbilt University, Nashville, Tenn.—"Synthesis in the Oil Industry."

November 28, University of Tennessee, Knoxville, Tenn.—"Motor Fuels and Lubricating Oils."

November 29, Kingsport, Tenn.—"Modern Products From Petroleum."

November 30, Roanoke, Va.—"Synthesis in the Oil Industry."

PANAMA CANAL SHIPMENTS

The following amount of oil passed through the Panama Canal during the month of September, 1934, as reported in the cargo declarations showing the movement, by directions, in the United States intercoastal trade and in the total traffic. The figures are for tons of 2,240 pounds.

UNITED STATES INTERCOASTAL

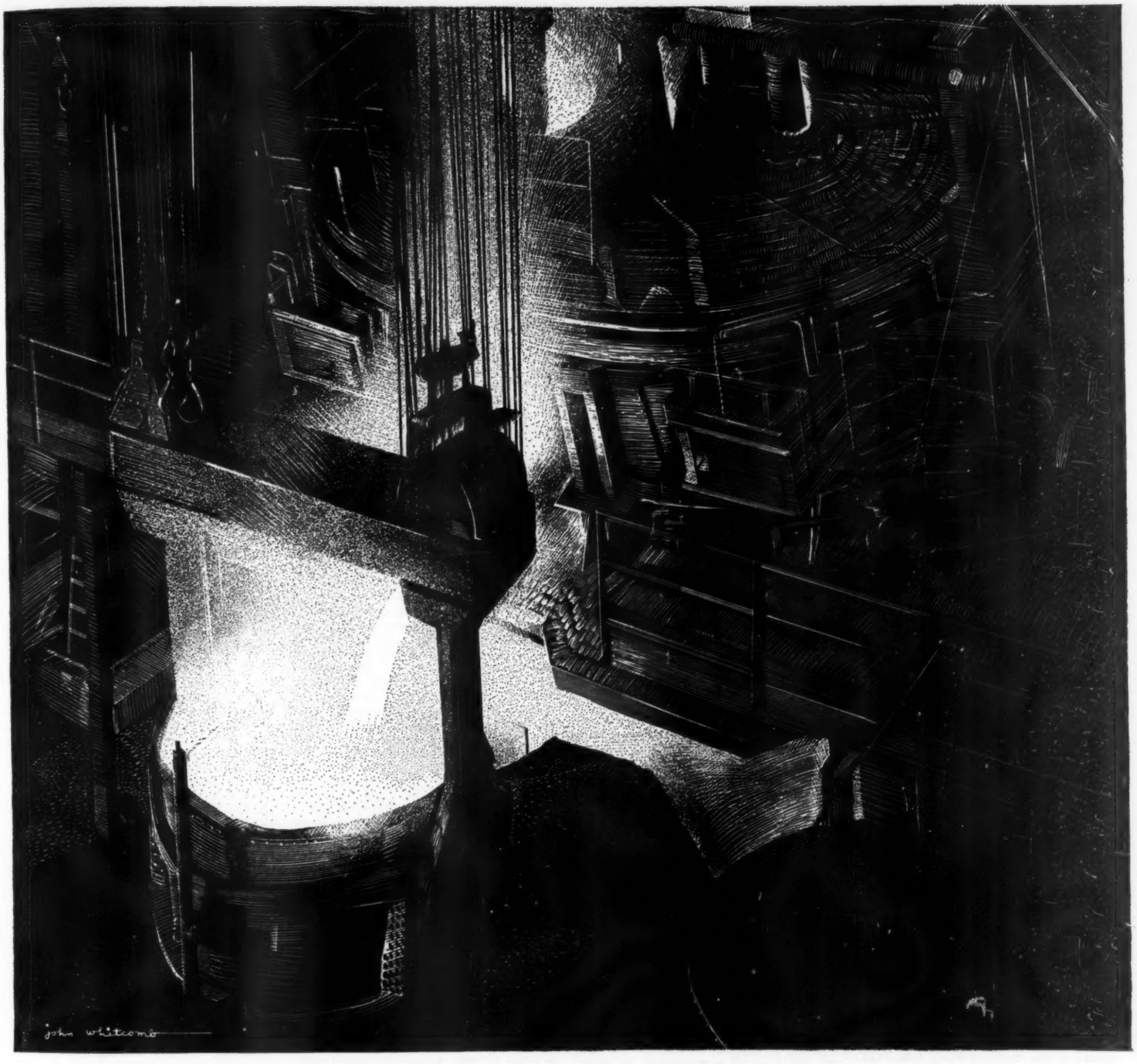
	Atlantic to Pacific	Pacific to Atlantic
Crude	....	.....
Gas and fuel oil	2	93,546
Gasoline, benzine and naphtha	17	98,614
Kerosene	....	11,350
Lub oils and greases	6,264	1,509

TOTAL FOR ALL TRADE ROUTES INCLUDING U. S. INTERCOASTAL

	Atlantic to Pacific	Pacific to Atlantic
Crude	....	135,927
Gas and fuel oil	2	105,873
Gasoline, benzine and naphtha	113	118,875
Kerosene	242	12,159
Lub oils and greases	18,371	1,552

ALBERTA GASOLINE PROBE

EDMONTON, Alberta, Nov. 10.—A possible inquiry by the provincial government into gasoline and fuel oil prices and distribution was forecast last week by R. G. Reid, premier of Alberta. A measure of government control of marketing and prices is under consideration.



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Late Fields

KANSAS

Texas Co.'s No. 1 Grove, C NW NE NE Section 29-19-9w, Rice County, Kansas, pumped 1,441 bbls. in 21 hours from pay at 3,194-98 feet. Locations were made for No. 2, NE NW NE, and No. 3, NE NE NE Section 29.

Olson Oil Co. and Shell Petroleum Corp.'s No. 1 Downie, C SE SW NE Section 14-23-4w, Burrton Pool, Reno County, after an acid treatment at 3,586-3,603 feet, produced for 14 hours at the rate of 5,400 bbls. per day. Barnsdall Oil Co.'s No. 2 Baughman, C SE NE NE Section 34-23-4w, after an acid treatment, produced 5,481 bbls. in 24 hours.

Dickey Oil Co.'s No. 1 Yaw, C NE SE NW Section 20-28-1e, Sedgwick County, was at a total depth of 3,017 feet with 1,250 feet of oil in the hole from chat topped at 3,071 feet, and with oil at 3,091-92 feet.

OKLAHOMA

In the Polo Pool, in Noble County, Oklahoma, Stanolind Oil & Gas Co. and others' No. 1 DeVore, C SW SW NW Section 27-22-2w, flowed 1,323 bbls. in 13½ hours from Wilcox sands at 4,833-79 feet and 4,897-4,902 feet. Stanolind Oil & Gas Co. and others' No. 3 Earl, C NE NW Section 28-22-2w, flowed 1,014 bbls. in 20½ hours from Wilcox at 4,847-69 feet. Stanolind Oil & Gas Co. and others' No. 4 W. H. Voss and others, was drilling in Wilcox sand with the well producing at the rate of 720 bbls. a day. Wilcox was topped at 4,805 feet and the drill was 42 feet in the sand when this report was made.

Late report from the South Burbank Field in Osage County, shows Carter Oil Co.'s No. 2, in the NW cor. Section 2-25-6, having produced 5,368 bbls. in 48 hours from sand at 2,750-2,835 feet.

Gled Oil Co.'s important wildcat test in Johnston County, C SW SE NE Section 26-2s-8e, was drilling at 2,200 feet, with Wilcox sand expected at about 2,300 feet.

MAGNETIC STORM

Tucson, Ariz., observatory of the U. S. Coast and Geodetic Survey reports a moderate magnetic storm started at 11 p.m. (C.S.T.) on November 7 and ended at 8 a.m. (C.S.T.) November 8. Telegram follows:

"Storm began seventh. Five. Moderate. Ended eighth. Fourteen."

Still 35,000 Barrels of Hot Oil Daily in Texas Fields

(Continued from Page 36)

for alleged by-passing of oil; receiving and producing oil in violation of the proration laws and failing to make daily reports to the Railroad Commission. Attorney General Allred said his department intended increasing its activities against violators. He conferred with L. R. Martineau, Jr., special assistant to the Attorney General of the United States, and with Norman L. Meyers, J. Howard Marshall and Ralph Horween of the Federal Tender Board and pledged co-operation.

Nine Gasoline Grades Suggested by Refiners

(Continued from Page 39)

partment of Interior and Justice was the basis for the suspension of the gasoline buying program in East Texas. General belief is some means will be found to permit buying to proceed but confusion exists due to the closeness of the November 17 hearings regarding the legality of the Federal Tender Board.

Viscosity Index Discussed

Refiners will ponder the suggestion that genuine need is developing for motor oils having a viscosity index of 120 or better. They could not help but witness the general interest in the principle of manufacturing lubricants by the use of solvents but they expressed surprise that the need for oils of suggested viscosity index may be drawing so near. The exponent of the idea was M. Otto of the Standard Oil Development Co., who in collaboration with F. L. Miller, A. J. Blackwood and G. H. B. Davis, all of the same company.

A kindred paper was that of Dr. R. E. Wilson of the Standard Oil Co. (Indiana) and P. C. Keith, Jr., of the M. W. Kellogg Co., in which the recent developments in propane refining technique were outlined.

Diesel Developments

More than the usual amount of time and discussion were devoted to Diesel engines and Diesel fuels to indicate the growing popularity in that type of motive power. A paper by C. C. Moore, Jr., and G. R. Kaye, of the Union Oil Co. of California carrying the title "The Evaluation of the Ignition Characteristics of Diesel-Engine Fuel Oils" contained an excellent summary of finding based upon actual operating tests.

Following this paper, J. Geschelin of Automotive Industries, discussed the "Economic Status of the Automotive Diesel Engine in Road Transportation" and of course that subject strikes close to the heart of refining operations.

The detailed discussion of the Diesel engine from an operating standpoint was not lost sight of in the meeting either and W. G. G. Godron, of the Socony-Vacuum Co., Inc., probably drew most interest in his explanation of what he termed the "oil wedge principle."

Institute Facing Decision on Federal Legislation

(Continued from Page 42)

who hates to see waste. Considering the record, there is little wonder that so large a section of the oil industry has been operated at an average loss during the past few years. It is surprising that more companies have not gone into the hands of receivers. Sooner or later, unless the industry is stabilized on a basis that will yield a fair profit to those engaged in it and unless the wasteful and unbusinesslike competitive practices that I have referred to are corrected, the entire oil industry will have to pay the reckoning.

Another insidious and destructive practice for which the integrated companies in particular are responsible is that of selling gasoline to competitors with the full knowledge and, perhaps, even with the clear intention, that such gasoline is to be resold at prices that will undersell the service stations of the very company that is dumping the gasoline. I respectfully submit that this is the most astounding notion of all. It is a practice for which the oil industry itself is directly and solely responsible. The code gives the oil administrator no power to control this uneconomic practice.

Underselling Own Market

Let us suppose that I am the manufacturer of a well-known brand of gasoline for which I have spent thousands of dollars in advertisements and many years to establish a market. This gasoline has a trade-name that is proclaimed to passing motorists from every billboard. Shortly I adopt the practice of selling this same gasoline, although not under its trade-name, to competing service stations which in their turn sell it at lower prices under a different tradename, or merely as gasoline. It seems to me that as the result of this practice I cut a rather absurd figure. I doubt whether I can claim credit for being a very good business man. On one corner I have used my stockholders' money to build a de luxe service station with all modern improvements. At this station I sell the gasoline of my company at its posted price, while across the street a rival service station sells that same gasoline, at let us say, 2 cents a gallon under my price.

When we consider this practice in cold blood, we know that something is wrong somewhere.

I wonder if the stockholders of the companies responsible for these conditions understand fully what is going on. If they do, they are even more complacent than is the ordinary run of stockholders. I suspect that all companies would be on a sounder financial basis, and therefore able to pay higher wages and larger dividends, if they were run on more prudent business lines. Imagine Henry Ford selling his cars to rival manufacturers so that they might be put on the market under different names and at prices below those that he demands. I doubt whether, in any business in the whole United States, except that of oil, similar practices prevail, at least to any extent. My belief is that the oil business is in a class quite by itself in several extraordinary particulars.

Whether or not the stockholders in the oil companies know how the oil business is being conducted in America today, I know I am well within the mark when I say that the people do not know what has been going on. I doubt whether even the Government has so far fully appreciated the situation. But the people are catching on and I believe I can assure you that when they are made acquainted with the facts, as they will be, because this whole oil business, as I have said on more than one occasion, is peculiarly affected with a public interest, they will demand drastic reforms. The danger is that unless you yourselves speedily adopt and apply corrective measures, the pendulum may be made to swing further in the opposite direction than is either desirable or necessary.

I beg of you not to make the mistake that the railroads made in their day and that the public utilities more recently have made. If you would escape the heavy hand of the Government, which, sooner or later, will be charged with the duty of carrying out the grim purpose of the people that such abuses as exist in the oil business shall no longer be tolerated, then set your house in order and do it without delay. This advice is given in a friendly spirit by a man who wishes you well and who would help you if he could. But the remedy lies almost entirely with you.

The oil administration has been assured over and over again that if we would only stop the running of hot oil, you would be able to correct the other abuses from which your industry suffers. I am confident that with the setting up of the Federal Tender Board, we have provided machinery by which, without unduly restricting or hampering the free movement in interstate commerce of petroleum products manufactured from legal crude oil, we will be able to put an effective stop to the illicit trafficking in hot oil. The Federal Government is doing its part and it is distinctly up to the oil industry itself to reform its own marketing practices and to come to some reasonable accord with independent refineries and independent service stations, which will allow them to live and make a reasonable profit. There is no reason, aside from the question of conservation that is involved, for the Federal Government, by restricting the production of oil, to assure a reasonable profit to the large, integrated companies, if those same companies, while denying a share in the profits to the independent refiner and the independent service station, allow them to be frittered away through improvident and indefensible marketing practices.

Talks Frankly

There are other matters that I would like to discuss with you, but I have already overtaxed your patience. In substance I have said to you what I came all the way from Washington to say. I have talked frankly, but I hope without offense. I have tried to discuss matters with you as one engaged in a joint enterprise. As the representative of the United States Government, upon whom the obligation particularly rests to do whatever may be possible to help you solve your problems, I offer you every assistance that may be within my power. I believe I have proved to you during the few months that I have been administrator under the oil code that I have no personal ax to grind. I have tried to look objectively at each problem as it has arisen. My only interest has been to help you to find solutions for your difficulties that would be for the benefit of the whole industry and therefore to the advantage of the country. And by the whole industry I mean employes as well as employers, independents no less than big integrated companies, landowners, lessees, stockholders and retailers; in short, anyone and everyone who has any manner of interest in any phase of the business of producing, processing and marketing oil and its products.

I have not the slightest doubt the Government can help you in solving your problems. I know the Government wants to help. But the Government cannot aid effectively if the industry stands on the sidelines and does not co-operate. You must do your share. We must be partners and not rivals; collaborators and not critics; protagonists and not antagonists.

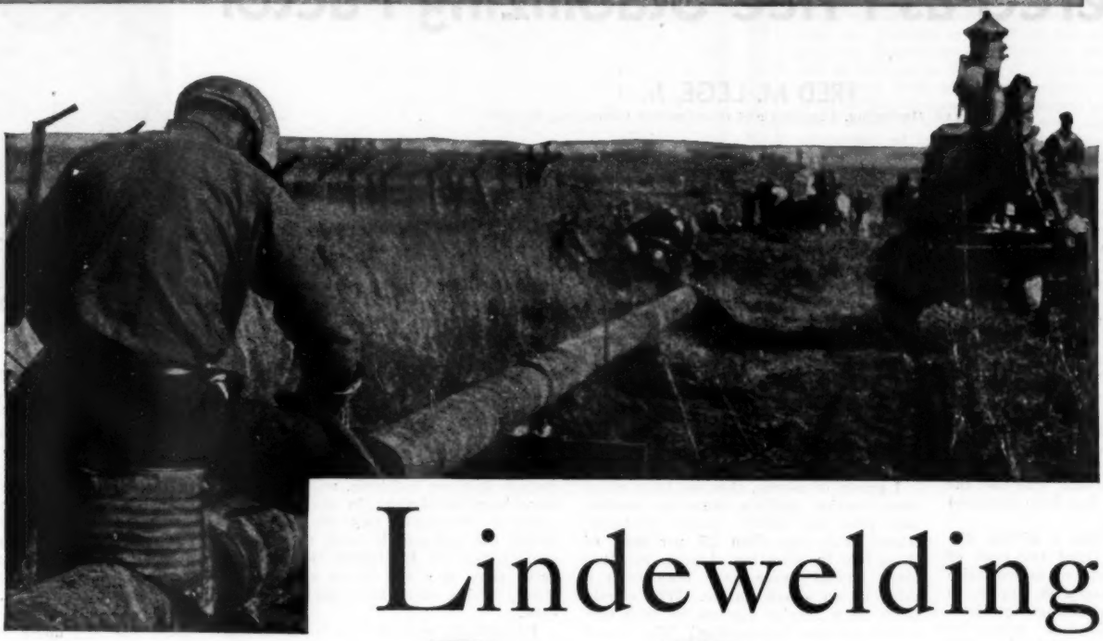
Of course, I understand that the lawless minority, which would wreck the industry and even the country for the sake of a filthy profit, openly and blatantly wants the administration to fail. That opposition I welcome. But if we fail it will be at the cost of the whole oil industry. You will have to pay the price. If the oil administration should fail, the chaotic conditions that formerly prevailed in the industry will almost inevitably return. That would mean the big fellow gobbling up the little fellow; oil sold below the cost of production; price wars, spelling the loss of investments; and labor vainly seeking jobs. In the clash of contending interests everyone in the end would lose.

Topsy-Turvy Superstructure

It must be clear to all that the topsy-turvy superstructure built on the oil industry must be carefully taken down, piece by piece, in such a way as to cause the least injury. Otherwise, sooner or later, it will fall of itself in utter collapse. In that event many thousands of people will be irreparably injured. It is also clear that there are certain practices in the oil industry clamoring for reformation that only the industry itself can take care of. I not only suggest to you, I urge you, to address yourself with all your ability and with the gravest possible concern to the correction of the abuses that we all know exist in the oil industry. Some matters, particularly the regulations of the supply of crude oil, it seems to me, on the basis both of reason and of experience, can best be handled by the Federal Government working in close co-operation with the governments of the oil producing states. Such part of the entire load as can be most effectively carried by the Government I have no doubt the Government will be entirely willing to assume for the common good. It is not necessary for me to say, I hope, that our experience during these past months has demonstrated that it will be difficult for the Government to carry effectively its part of the responsibility unless it has the wholehearted and cordial support of the oil industry. Aside from the regulation of the supply of crude, there are questions of control and management that can be worked out to the best advantage of all if the oil industry itself will assume responsibility in that behalf, with such help on the part of the Federal Government as we are able to render. In all such matters we are, of course, anxious to help to the full extent of our ability.

The problems of the oil industry are not insoluble. With you, we can work them out if you wish to do so. We can solve them if, together, we are determined upon that course and if, in a spirit of co-operation and understanding and mutual good will, we shall approach the subject with the purpose of finding a solution that will serve the greatest good of the greatest number. The Government is not only willing, but ready, to fight this thing through for the ultimate good of the country as a whole. How about the oil industry?

YOU CAN ORDER EVERYTHING FOR PIPE LINE LINDEWELDING FROM LINDE



Lindewelding *speeds up Pipe Re-laying*

A LINDE customer had a hurry call for a 42-mile gathering line. Plenty of usable pipe was available in abandoned lines. From past experience this concern knew Linde Process Service could give valuable assistance... and help save money. Linde was called on to help reclaim enough 8-in. pipe, in lengths averaging 18 ft., to do the job in record time.

Linde Service Operators went to work... right on the firing line. They demonstrated the best way to use the Wagner Cutting Machine for reclaiming used pipe. They instructed the operators of welding equipment in the latest Lindewelding technique... and stayed on until the job was well under way.

Results came fast. With Lindewelding, more than three times as many welds were made in the time required by other methods. Welders averaged 45 welds per 8-hr. day. One welder made eight welds in one section in *just 58 minutes... nearly one weld every seven minutes!* And... over 25 per cent less oxygen, acetylene and rod were used per joint than on previous work!

Performance records are a good reason why this customer, like many others, continues to buy *everything for pipe line welding and cutting from Linde.* All Linde customers are entitled to the full cooperation of Linde Process Service.

Linde Process Service can help you, also, to organize pipe line welding and cutting operations for greater speed, dependability and profit. Linde's experience with the special job of reclaiming and relaying old pipe lines has been extensive and thorough. If you have a job of this special nature, you should avail yourself of Linde's store of profitable data and time-saving developments.

Ask the nearest Linde Sales Office to show you without obligation how Linde can be of help to you on all your pipe line construction operations.

UCC — PRODUCED BY A UNIT OF UNION CARBIDE AND CARBON CORPORATION

THE LINDE AIR PRODUCTS COMPANY

Unit of Union Carbide and Carbon Corporation

UCC

NRA CODE

Sales Offices: Atlanta Baltimore Birmingham Boston Buffalo Butte Chicago Cleveland Dallas Denver Detroit El Paso Houston Indianapolis Kansas City Los Angeles Memphis Milwaukee Minneapolis New Orleans New York Philadelphia Phoenix Pittsburgh Portland, Ore. St. Louis Salt Lake City San Francisco Seattle Spokane Tulsa

IN CANADA, DOMINION OXYGEN CO., LTD., TORONTO

LINDE OXYGEN ▪ PREST-O-LITE ACETYLENE ▪ OXWELD APPARATUS AND SUPPLIES ▪ UNION CARBIDE

Sliding Scale of Dealer Margins Is Offered as Price Stabilizing Factor

FRED M. LEGE, Jr.
Chairman, Marketing, Planning and Coordination Committee, Texas*

FRED M. LEGE, JR.

During the past year, as chairman for marketing in the State of Texas, I have had impressed upon me very forcibly that the method of marketing petroleum products is one of the things the industry must correct. We all agree on this; we differ only when it comes to the question of how. Unsound business judgment, unlawful, ruthless competition, petty jealousies, and the "rule or ruin" policy must be converted to sound business policies, economical distribution, and fair, legal competition, if we expect to bring our marketing activities out of the red.

The high cost of marketing is brought about by several unsound methods of sale and distribution. One—and I think perhaps the most important one—is the dealer margin, which has been assigned to me for discussion.

I take the position that a sliding, differential scale, or a fixed per cent of discount, on the sale of any merchandise is sound. This, in my opinion, applies to stable prices as well as fluctuating prices.

The Texas stabilization committee worked out a schedule which they felt was adapted to conditions in Texas, in which they showed the application of such a sliding scale. This sliding scale uses a third grade gasoline, retail price of 11 cents, tax not included, as a base when the crude price is $1. For each 1 cent decline in price, the dealers' margin is reduced one-quarter cent. When the retail price reaches 5 cents per gallon, tax not included, the dealers' margin remains fixed at 1½ cents per gallon. On house brand gasoline, they have used a retail price of 13 cents per gallon, tax not included, as a base, and the dealers' margin is reduced in the same manner with a minimum fixed margin of 2½ cents per gallon, and on Ethyl, a base price of 15 cents per gallon, with a minimum dealer margin of 2½ cents per gallon. Transportation costs will, of course, vary the price at various points.

Fixed Per Cent of Discount

By a fixed per cent of discount, they mean the dealer should receive a commission based on a fixed per cent of the amount of money received per gallon on gasoline, less the tax. By this method, the dealer's margins are increased or decreased as the price of gasoline varies up or down. This method of reimbursement is universally practiced wherever commissions are paid, and I see no reason why the oil industry should be an exception.

I appreciate that some marketers, due to natural aptitude, or to some natural or acquired advantage or organization or situation, or whatnot, can, at a profit, sell the same article for less than their competitor up the street, and that some marketers, due to volume, can buy their merchandise at a lower price than another marketer who buys a smaller quantity. However, after all these factors have been given full consideration in our case, they are not compelling reasons for the method used in the differential allowed the distributor or the service station dealer.

The industry has experienced and is now experiencing terrific losses in the sale of petroleum products through the large majority of service stations in Texas. Most of you present can recall when the average service station employe pumped 5,000 gallons of gasoline per month. Today it is very doubtful if the average gallons of gasoline pumped per station would equal one-half of the 5,000 gallons per month formerly dispensed by a single employe. Consider for a moment the cost per gallon for the dispensing employe alone, and you cannot help realizing that the dispensing cost per gallon of gasoline at a service station is entirely out of reason; and, when you consider the enormous investment in property and equipment, in addition to the dispensing cost, you must realize that "there is something rotten in Denmark."

Too Many Stations

I grant, of course, that we have many more service stations than are needed, and that the public would be better served with less than 25 per cent of those now in operation. I grant you that there should never have been such a thing as an offset station. Why should there be a service station on each corner of a street intersection? The second or the third or the fourth station did not bring new business to that street intersection and they were never expected to. They were built to get a part of the business that had been developed by the first service station, which had ample capacity to supply the needs at that point, and was economically dispensing petroleum products, with a fair profit to the owner or operator.

Do not think I am advocating a policy of standing still. I believe in expansion, but I feel that constructive expansion only will endure.

It seems to me that increased volume should imply increased consumption. And, in this connection, I fail to find where, in recent years, much, if any, study was made as to how a drive for volume would increase consumption. A drive for volume to meet demand or potential demand, or to increase consumption, is sound, but I do not find where, in recent years, this has been the objective.

I do find, on the contrary, that, in recent years, the effort to get volume, almost invariably, was a determined effort to get the business of a competitor by cutting his price, giving his dealer a wider spread, encouraging the dealer to give secret discounts, etc., and we must, sooner or later, pay the price of this folly.

The present method of increasing volume is, apparently, an endless chain. Today A cuts B's price and raids his gallonage. Can A then count upon keeping that business? No, he must expect a counter move by B to regain it, or perhaps C suddenly takes both of them by surprise with some very clever ruse.

Automobile Saturation

It was inevitable that the market would eventually approach the saturation point. Those who created the market knew their equipment would wear out and become obsolete, and they also knew they would have a market for those replacements; but these replacements did not increase the consumption of gasoline.

On the contrary, this new equipment, greatly improved, reduced the consumption of gasoline per unit, and, naturally, the consumption of lubricating oil. It might be argued that this was somewhat offset by high speed traffic, which had a tendency to slightly increase gasoline consumption, thus helping to preserve that balance, but high speed did very little to increase lubricating oil sales, due to the improvement in the lubricating oils and the higher efficiency of the equipment.

Apparently, marketing executives have not yet adjusted themselves to this saturation point of the gasoline market. Accustomed for many years to constantly increasing gallonage, they began raiding each other's outlets, instead of continuing to supply at a profit that business already theirs, or, if they must have increases, finding some new market.

In the mad scramble to secure the existing business of a competitor, no consideration was given to the cost of marketing. If there had been, millions would have been saved that, in our lives, will never be regained. Buy the gallonage, forget the cost—so it went merrily on, until today the marketing cost far exceeds that of a few years ago, and is finally giving every marketer much concern.

I know that volume is a factor in any business, but I sincerely believe that, under the present method of marketing, it is one of the factors most seriously affecting the cost of distribution. And it will continue to be so long as companies A. B. C. and their various competitors continue to devise ways and means of shifting the volume from one company to the other, and back again, by increasing dealer spreads, etc.

Most of us, I think, have at last realized the folly of the course we were pursuing. But, now that we would turn back, we find our way barred to a large extent—and by whom? By the dealers whom we have trained for years in our footsteps, whose business judgment has been formed upon ours.

This is not intended as an indictment of all dealers—in fact, I think it applies to only a minority of them. But that minority is not only harming us, it is ruining the majority of the dealers by starting unlawful, vicious price wars.

Most of the 100 per cent dealers have their gallonage selling price fixed, as is also their buying price, and their suppliers are unable profitably to meet the gasoline cut price stations for the reason that they must pay 3 and 4 cents per gallon commission against the one-half and 1-cent commission the price cutter is satisfied with. As a result, many of the very best dealers are losing their business and plenty of money.

Cut Price Problem

On the other hand, there are protected marginal dealers, distributors, and commission agents—how many I cannot, of course, say—who, for the sake of gallonage and their own profit, are sacrificing a part of their guaranteed margin per gallon, and reselling to consumers and cut price dealers at a cut price, thereby forcing their supplier to cut his price against his own gasoline.

This, after all, is no more than natural. We, having heretofore placed the temptation before them, cannot expect all of them to withstand it. It does not make any difference to some dealers what the price of gasoline may be to the consumer, so long as their price is lower than that of their competitors. Every gallon that passes through the dealer's storage means so many cents to him. If his compensation were dependent upon the price at which that gasoline was ultimately sold, I think he would be working very energetically to get the price at a fair level, and he would not supply any gasoline to the price cutter, as he knows he cannot maintain an abnormal gallonage unless he cuts the price or makes some other unfair concession.

Some marketers contend that, as their business is done entirely through jobbers, distributors, and dealers, they will not go along on a plan that will place any variables on their sales. Frankly, I feel, from the study I have made, that these marketers are doing their distributors, their jobbers, their dealers, their stockholders, and the buying public a great injustice.

I feel that the jobber, distributor, and dealer should have a fair margin of profit, but I feel that they should treat one and all alike, and give no secret rebate to one customer while another pays the posted price, and that, at the same time, they should realize that the marketer who makes their business possible is entitled to a fair profit and should make it.

If the sliding scale or per cent commission scale were used, wholesale agents and dealers would not be so prone to cut prices below cost as some of them now are, as their doing so would reduce materially their own profit. With a fixed commission per gallon, there is absolutely no incentive for them to consider the marketer who supplies them, and who, through their actions, is forced to sell his product below cost in an attempt to remain in business.

Fair Margins

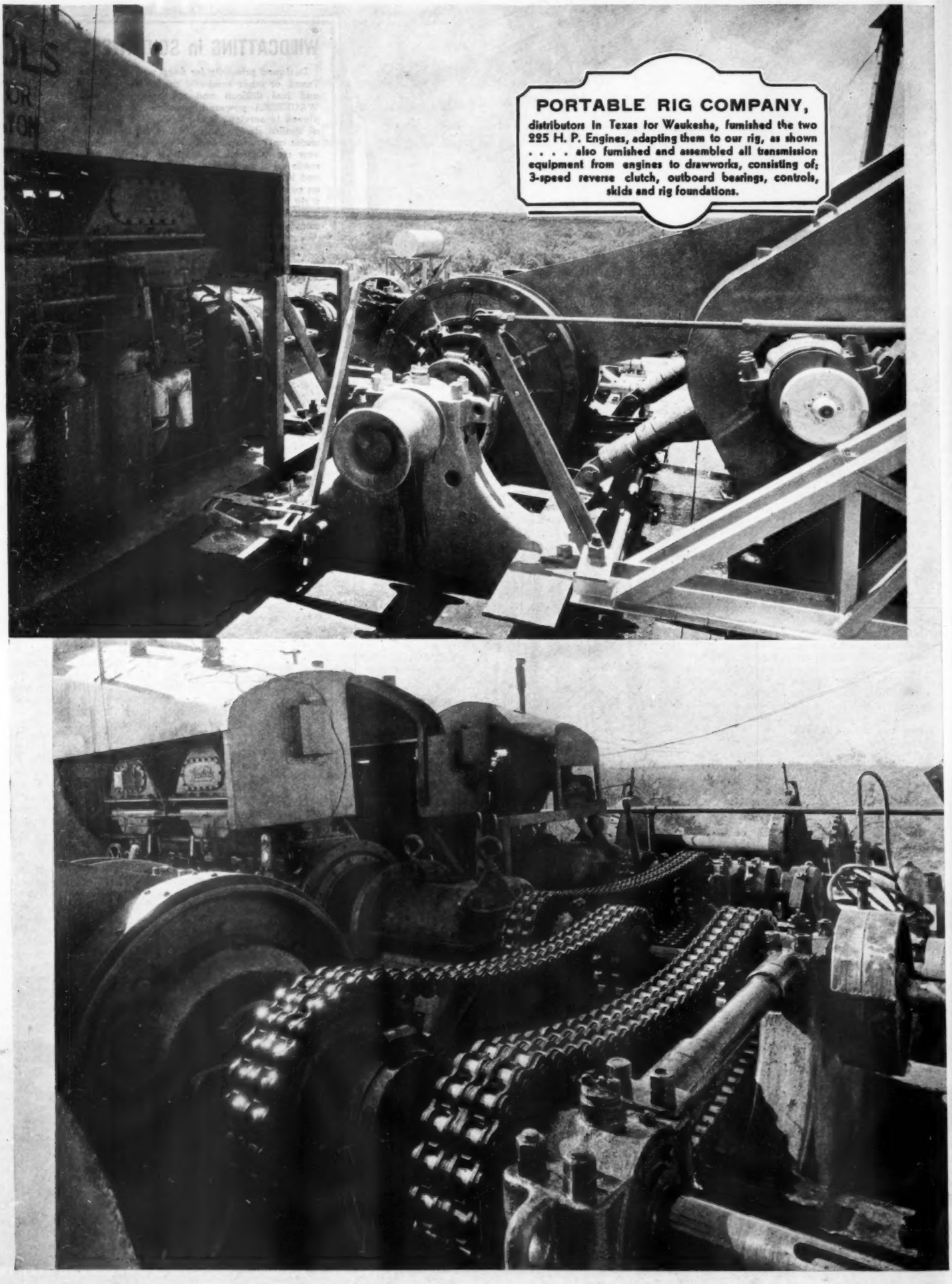
To allow the dealer between 20 and 25 per cent on the sale of gasoline, before taxes, would appear to me to be a fair—if not, indeed, a liberal—commission, and the wholesale agent's commission should be in proportion, or somewhere between 8 and 10 per cent.

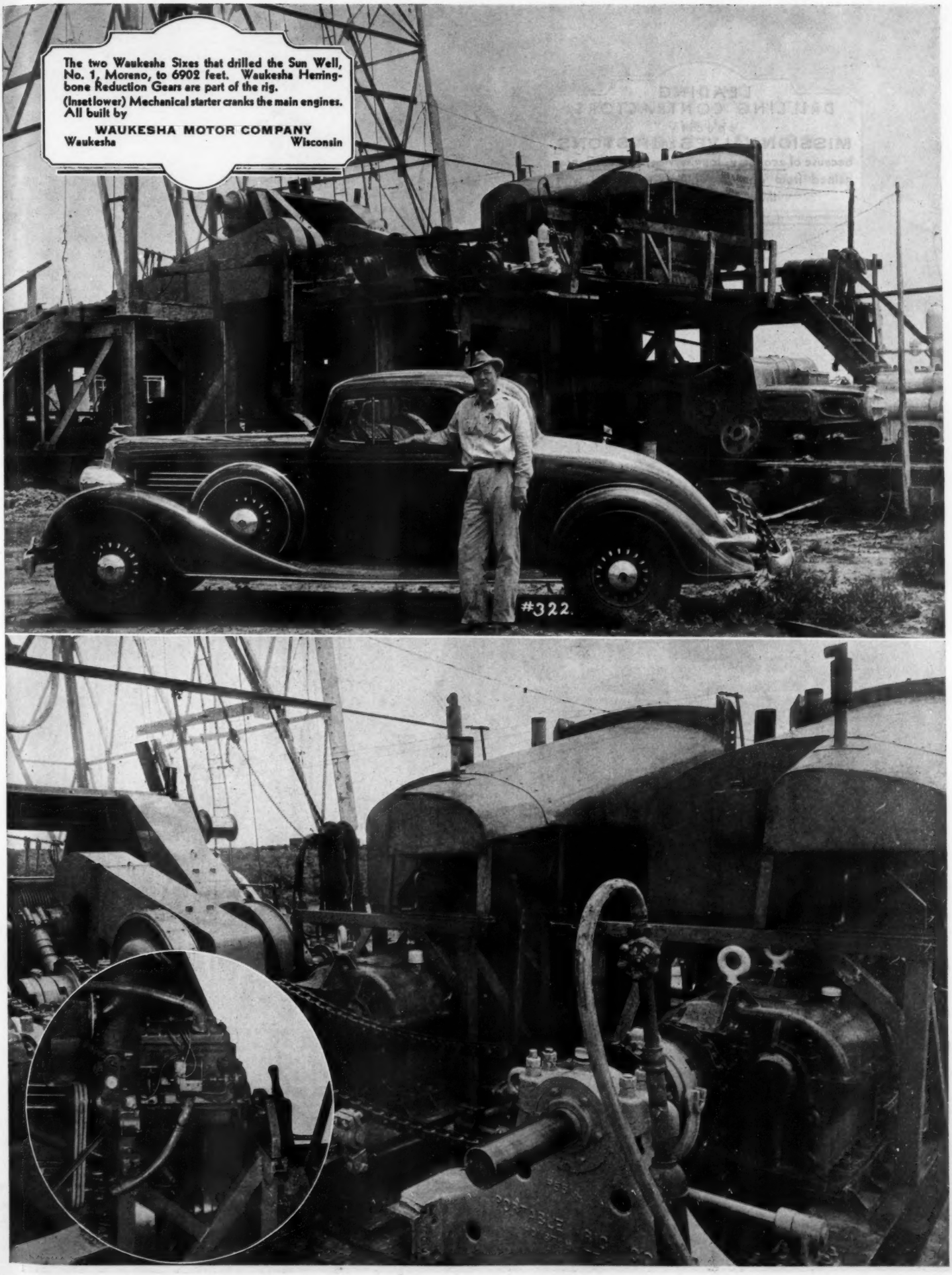
Please bear in mind that I realize there are many angles of marketing to be corrected—that the matter of dealer margins or discounts is but one of a number—and these suggestions are not offered as a cure-all for our problems. However, I do think that the adoption of a sliding schedule—not necessarily, of course, the one suggested—but schedules specially applicable to the territories in which they will be in effect—would be at least one step, and I think a long one, in the stabilization of prices and the reduction of distribution costs.

In conclusion, I wish to state that, in my humble judgment, some method, along these lines, of compensating wholesale agents and dealers would be most helpful to the refiner, jobber, distributor, wholesale agent, and dealer, as well as to the public, and that ultimately even the dealer and the wholesale agent would so regard it, and their P.&L. account be materially improved.

*Before A.P.I., Dallas, Tex.

WILDCATTING in SOUTHWEST TEXAS
Designed primarily for deep well drilling in Southwest Texas, or other semi-arid areas where water is scarce and fuel difficult and expensive to haul, this new WAUKESHA powered gasoline rig has recently been placed in service. It supplements a lighter gasoline rig of similar design now drilling in Duval County for a major operator, as well as our standard steam rigs. The new rig, pictured in detail on the following pages, is made up of mechanical units of the most advanced type, and is capable of drilling to 10,000 feet. It is available on contract work wherever conditions dictate the use of a rig of this character. Photographs presented herewith were taken on a location in Duval County, just prior to completion of a contract well bottomed at 6902 feet.
GEO H ECHOLS
DRILLING
CONTRACTOR
GAS AND STEAM RIGS
ESPECIALLY EQUIPPED FOR WILD-CAT WELLS AND DEEP TESTS
STERLING BUILDING
HOUSTON


PORTABLE RIG COMPANY,
distributors in Texas for Waukesha, furnished the two 225 H. P. Engines, adapting them to our rig, as shown . . . . also furnished and assembled all transmission equipment from engines to drawworks, consisting of: 3-speed reverse clutch, outboard bearings, controls, skids and rig foundations.

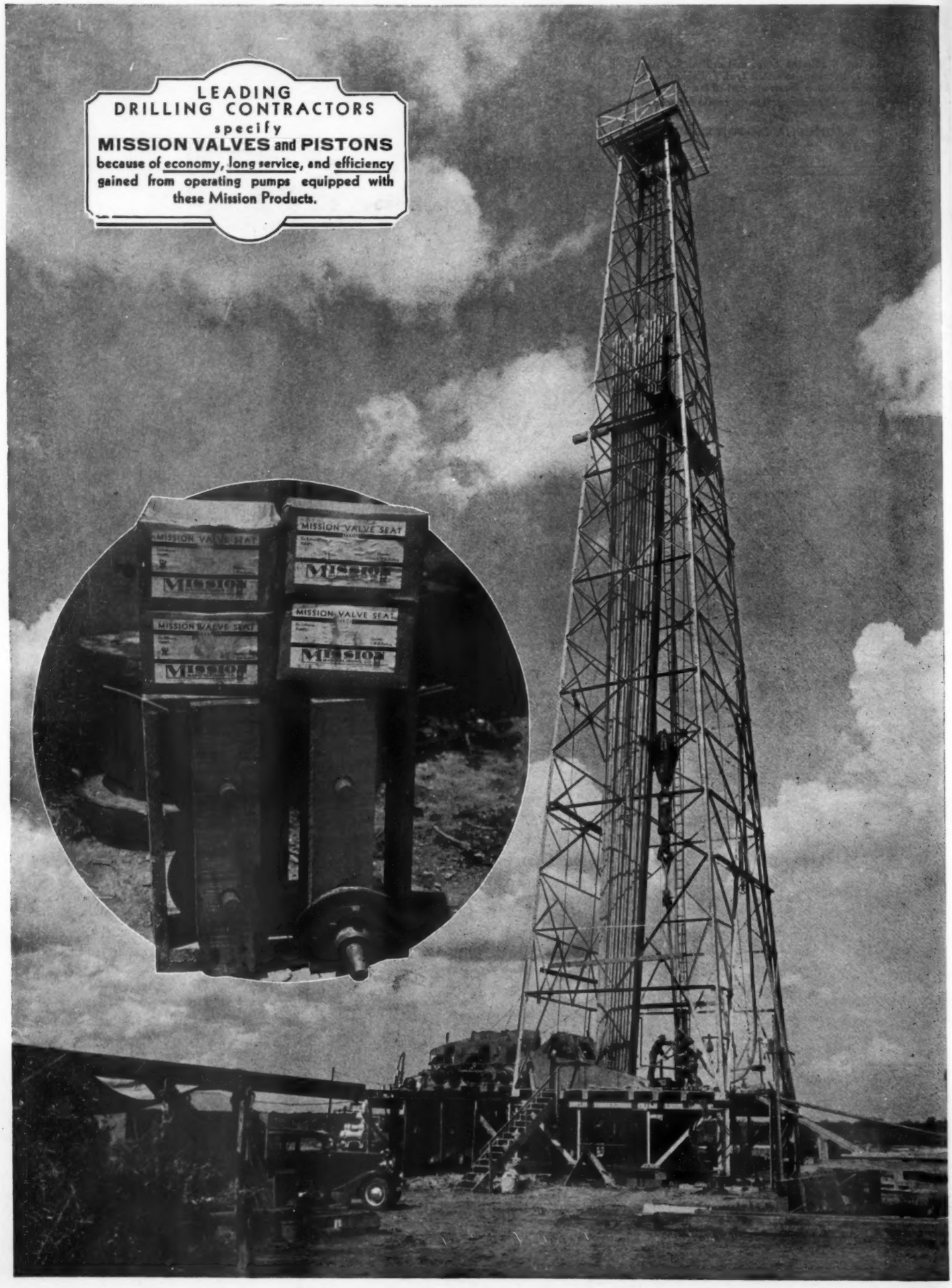


The two Waukesha Sixes that drilled the Sun Well, No. 1, Moreno, to 6902 feet. Waukesha Herringbone Reduction Gears are part of the rig.

(Inset lower) Mechanical starter cranks the main engines. All built by

WAUKESHA MOTOR COMPANY

Waukesha Wisconsin


LEADING
DRILLING CONTRACTORS
specify
MISSION VALVES and PISTONS
because of economy, long service, and efficiency
gained from operating pumps equipped with
these Mission Products.
MISSION VALVE SEAT
MISSION
MISSION VALVE SEAT
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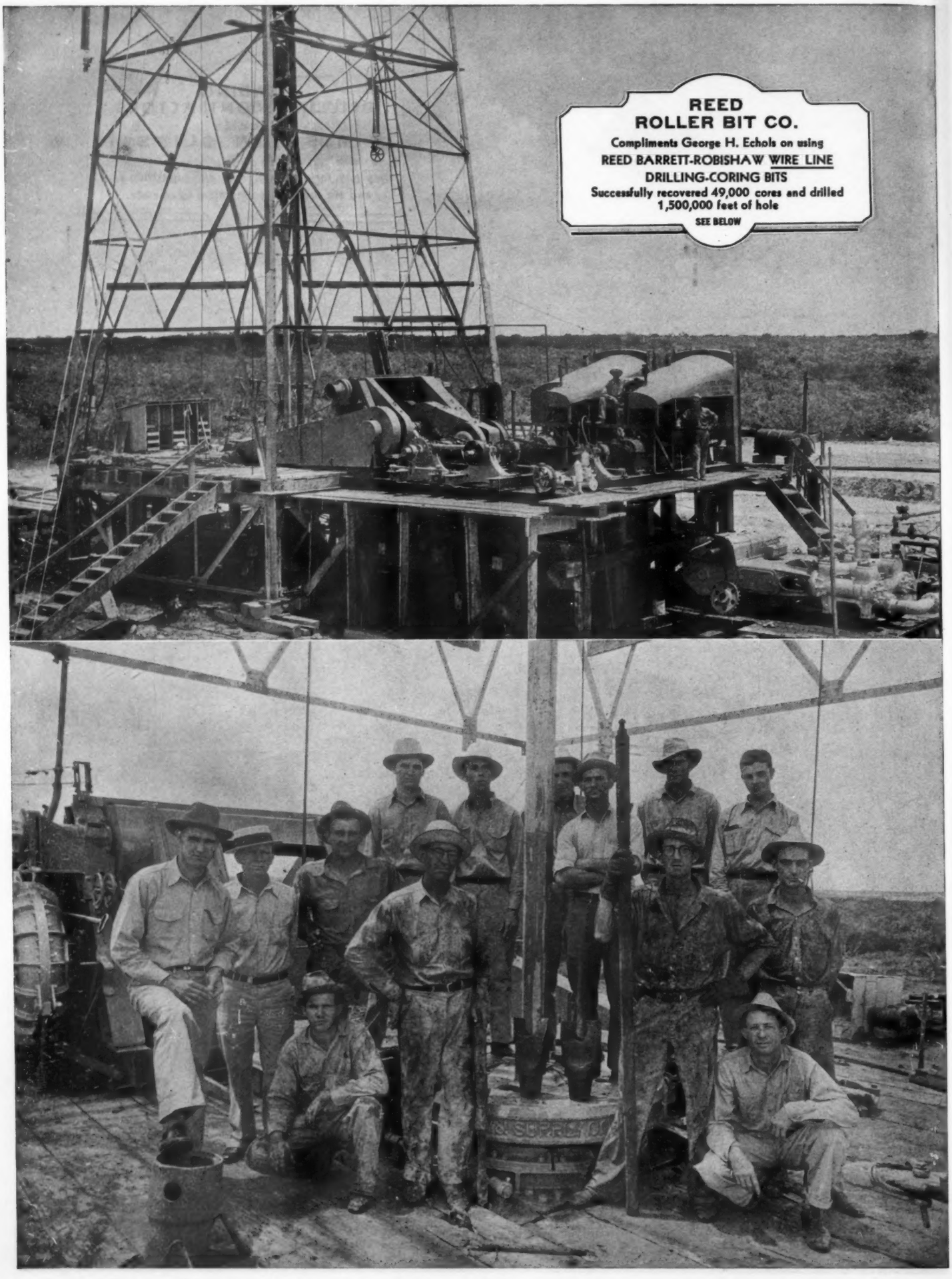
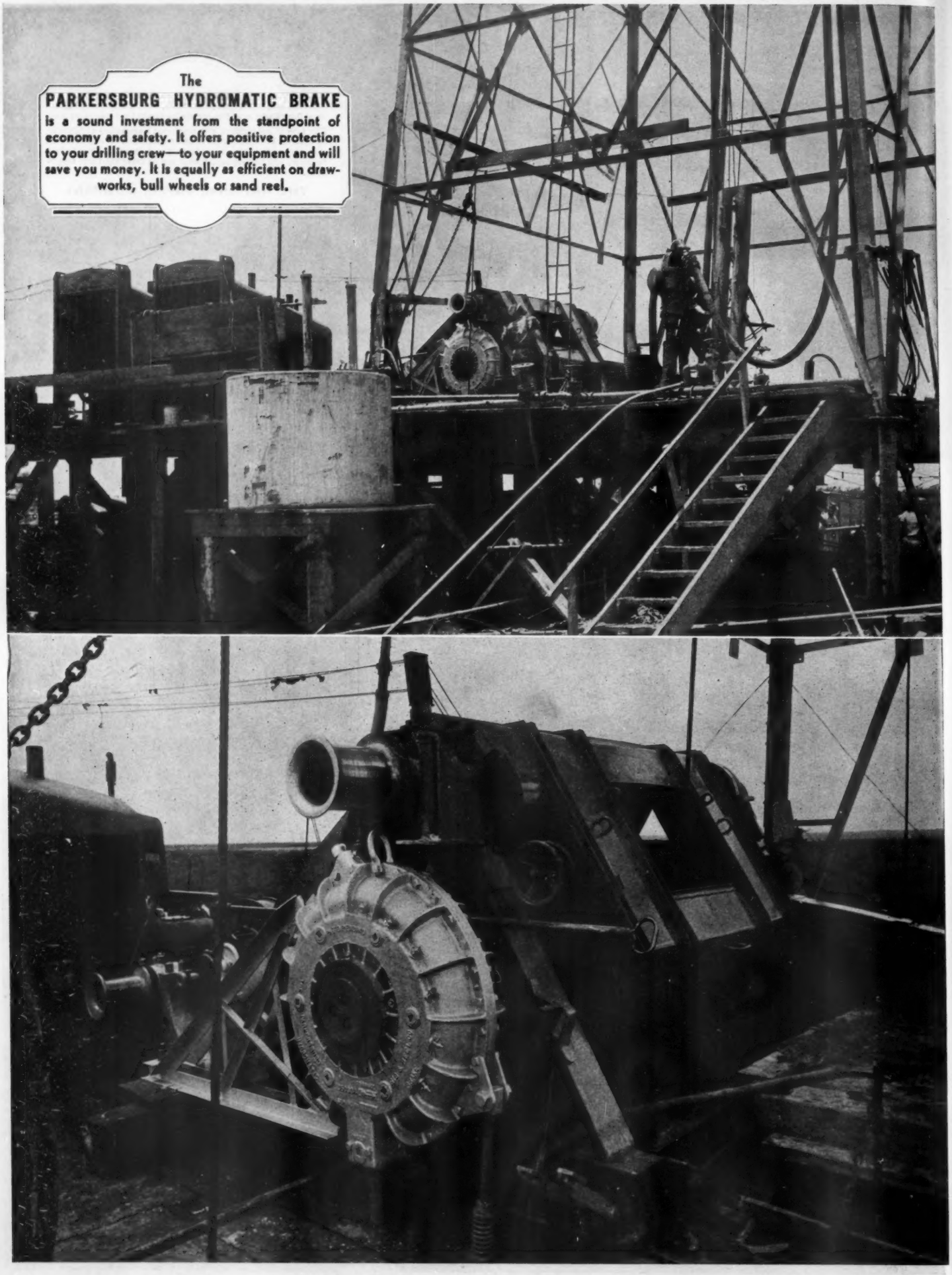
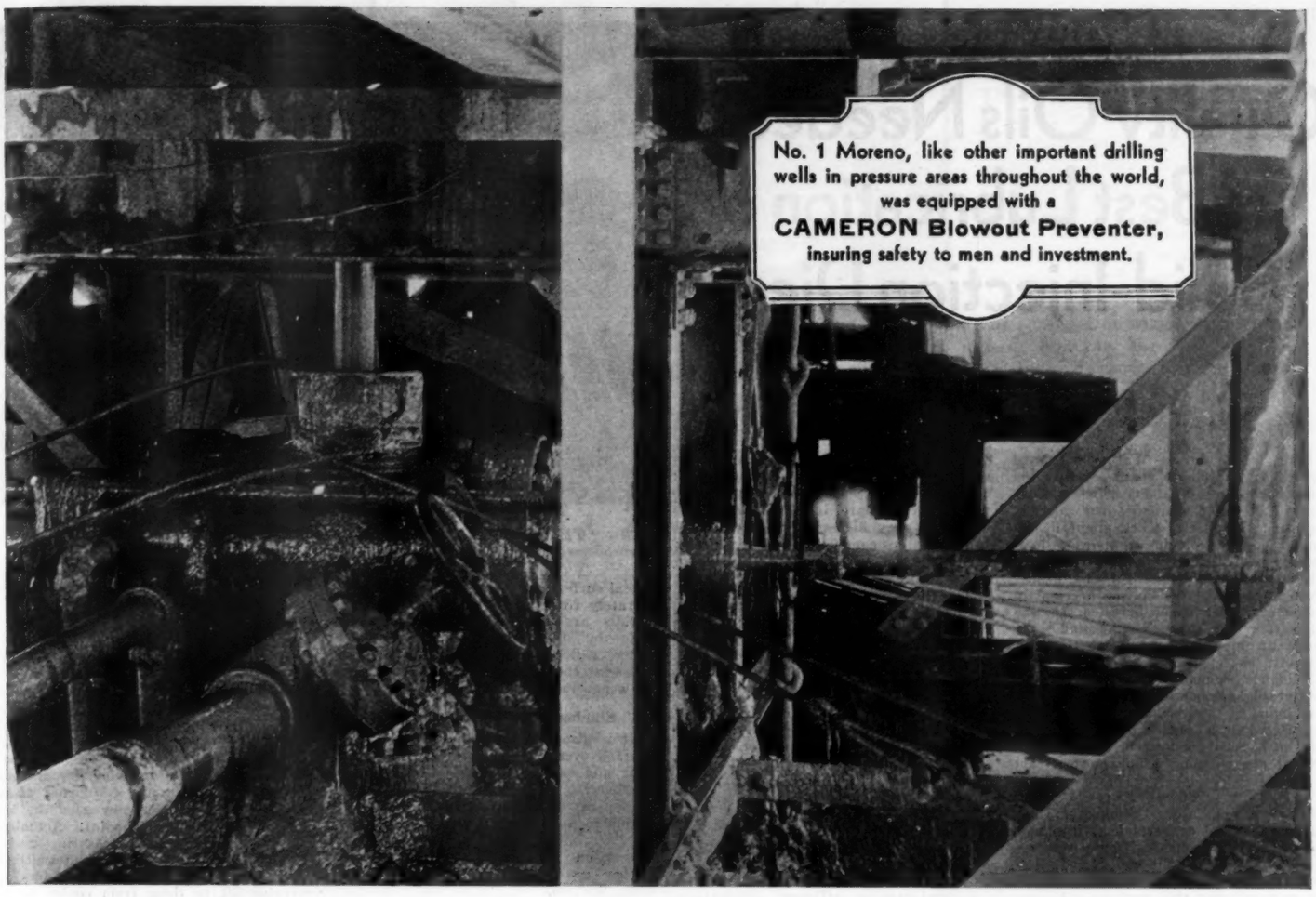
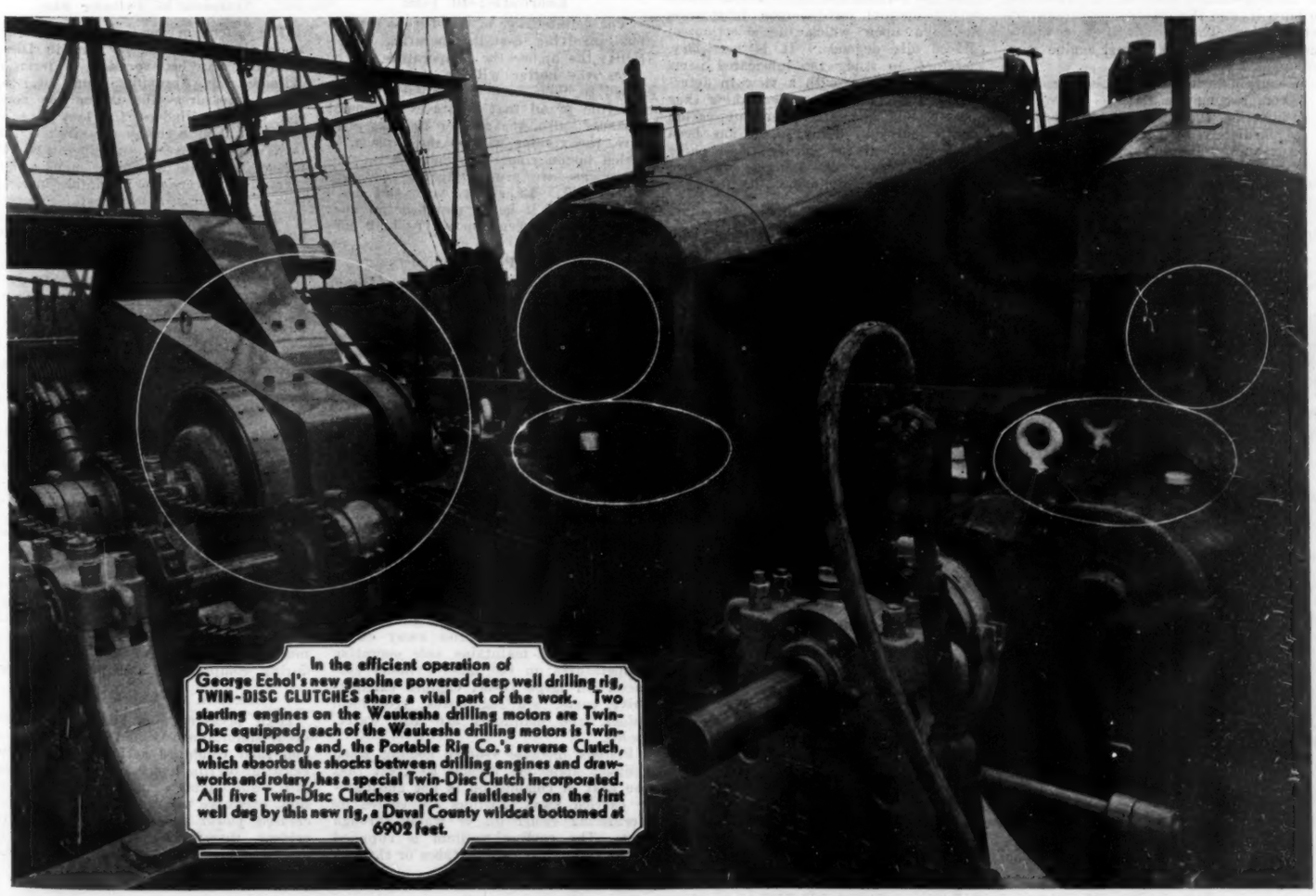
LEADING
DRILLING CONTRACTORS
specify
MISSION SLIPS
because
they pay for themselves in the pipe they save
and are the most economical to operate.


REED
ROLLER BIT CO.
Compliments George H. Echols on using
REED BARRETT-ROBISHAW WIRE LINE
DRILLING-CORING BITS
Successfully recovered 49,000 cores and drilled
1,500,000 feet of hole
SEE BELOW

The Ideal No. 28-HUH Unit Draw Works
combines all parts in a single assembly, thereby eliminating rigging-up of Draw Works as no framing into the derrick headboard is required.
This type of construction also eliminates transmitting of vibration by Draw Works to the derrick or other equipment. It may be moved from one well to another on the lease in a single unit, but if necessary to comply with highway regulation it can be taken apart into several units.
THE NATIONAL SUPPLY COMPANY

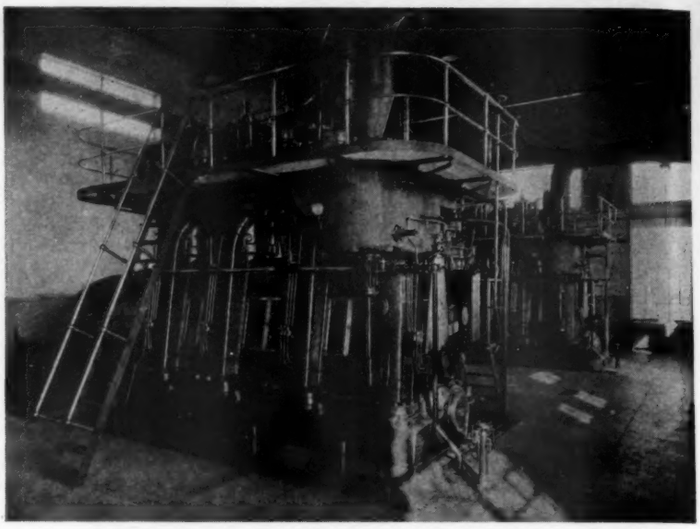

The
PARKERSBURG HYDROMATIC BRAKE
is a sound investment from the standpoint of economy and safety. It offers positive protection to your drilling crew—to your equipment and will save you money. It is equally as efficient on draw-works, bull wheels or sand reel.


No. 1 Moreno, like other important drilling wells in pressure areas throughout the world, was equipped with a
CAMERON Blowout Preventer,
insuring safety to men and investment.


In the efficient operation of George Echol's new gasoline powered deep well drilling rig, TWIN-DISC CLUTCHES share a vital part of the work. Two starting engines on the Waukesha drilling motors are Twin-Disc equipped; each of the Waukesha drilling motors is Twin-Disc equipped; and, the Portable Rig Co.'s reverse Clutch, which absorbs the shocks between drilling engines and draw-works and rotary, has a special Twin-Disc Clutch incorporated. All five Twin-Disc Clutches worked faultlessly on the first well dug by this new rig, a Duval County wildcat bottomed at 6902 feet.

Quality Oils Needed for Best Lubrication of Solid-Injection Diesels

By W. G. G. GODRON
Socony-Vacuum Oil Co., Inc., New York*



Three cylinder, two-cycle, Diesel engines in pipe line station

Long before James Watt constructed his crude atmospheric engine—before the early beginnings of steam power as we know it today—scientists had already suggested that useful work might be accomplished by exploding gunpowder in a closed vessel. As early as 1680 Huyghens actually built an engine on this principle. Yet experimentation was necessarily postponed, development arrested. It was only after the steam engine and the steam turbine were developed to high economy that engineers, reaching out for still higher economies, turned again to the internal-combustion motor. And today industry appreciates the possibilities offered by oil-engine power, and concedes to internal-combustion engines their rightful place among prime movers.

Principles

Like other internal-combustion engines, the Diesel converts heat into mechanical work by burning fuel within its cylinders; the resultant expansive forces move the pistons and operate the engine. For each cylinder this requires a charge of finely-atomized fuel oil, sufficient air to burn it, and the necessary temperature for ignition. The periods in a complete mechanical cycle of a Diesel engine may be summed up as follows:

a. charging with air;
b. compressing the air;
c. injecting fuel oil, accompanied immediately by combustion;
d. expanding the burning gases;
e. expelling products of combustion.

Each event is controlled by suitable cams and valves, or by properly-placed ports.

Unlike other internal-combustion engines, the heat of compression in a true Diesel ignites the finely atomized oil as soon as it is injected into the cylinders; compression pressures approximate 500 pounds per square inch, and are even higher in very high-speed engines. After injection stops combustion quickly ceases; the burned gases expand; and pressure drops accordingly.

The Diesel is, then, a high-compression engine; it is what is known as cold-starting, i.e., it requires no spark, no hot point, etc., to assist in the ignition of its fuel.

Cycles

Diesel engines operate on either 2 or 4-cycle principle, both of which are well understood, and require no detailed description. The small engines used in mobile equipment and operating at speeds in excess of 1,000 r.p.m. are, with very few exceptions, 4-cycle units. This design avoids the necessity for blowers or other scavenging mechanism.

Lubricated Parts

In maintaining efficient lubrication, there are certain operating factors which impose distinct duties upon lubricating oils, and upon which the selection of correct oils depends. It is necessary, therefore, to study the lubricated parts of Diesel engines, with a view to determining the conditions under which they operate, and analyzing their lubrication requirements. In doing so, it has been found practical to classify these parts for the purpose of analysis in two groups: a. Power cylinders. b. Bearings.

Power Cylinders

It is practically impossible to hold high-pressure gas between piston and cylinder head without the aid of an adequate sealing medium. Even when the metal surfaces are finely finished and accurately fitted, even when the best materials are used, there is leakage or "blow-by" between piston rings and cylinder wall. A viscous fluid is required to seal the extremely small openings between wall and rings.

Elimination of Metallic Friction

It is also impossible to rub one metal surface over another without generating heat and causing abrasion. To permit free motion, opposed metal surfaces must be separated by a suitable fluid medium—thereby replacing high metallic friction by low fluid friction. An adequate film of correct lubricating oil provides a proper piston seal and minimizes metallic friction.

Lubricating-Oil Film

The maintenance of this film is a problem involving certain operating conditions; the higher the temperature of the gases, the hotter will be the parts exposed to them, and the thinner will be the film of oil that separates the metal surfaces; also, the greater the gas pressure, the greater will be the force with which piston rings—particularly the upper rings—are pressed against the cylinder wall. In either case, the more difficult will it be to maintain an adequate film between opposed rubbing surfaces.

Heat in Power Cylinders

The film of lubricating oil on Diesel cylinder walls is miscroscopic in its thickness, and is exposed to the heat of burned or burning gases. The intensity of this heat varies from a maximum adjacent to combustion chambers to a minimum at the remotest point. Moreover, by the very nature of the piston movement, that part of the film which is exposed to highest temperature is thinnest, and remains uncovered for the greatest length of time. The entire film must be maintained, in spite of exposure to this range of temperature.

Cylinder and Piston Cooling

Without cooling, the lubricating-oil film would be destroyed faster than it could be formed, and even metal itself would soon be destroyed. Cooling water, by its circulation through cylinder jackets and heads, carries away excessive heat and maintains safe operating temperatures on the inner cylinder surfaces. In large Diesel engines exhaust-valve cages, stuffing boxes, cross-head guides, and manifolds are also water-cooled.

Pistons likewise require cooling when cylinder diameters become so great that the heat of combustion is not adequately carried away. Pistons are cooled by circulating either oil or water through them. The cooling medium is supplied either through telescopic tubes or through swivel-jointed pipes. Various methods are used for returning the coolant.

Influence of Temperature

Even with the aid of cooling there is a cylinder lubrication problem, which resolves itself into the continuous maintenance of extremely thin oil films, which are exposed to temperatures of 3,000° F. and above on one side, and cylinder-wall temperatures on the other. If this exposure continued for a long time, these films would be burned away completely—no matter how good the oil, nor how high its flashpoint. Actually, however, the quick reciprocating movement of the pistons gives intermittent protection, and replenishes the films by carrying oil to them from cooler parts.

Influence of Cylinder Size

The effect of heat and temperature upon the lubricating-oil film in Diesel cylinders may be expressed in terms of cylinder size. Assuming equal mean effective pressures—the larger the diameter of the cylinders, the less do gases lose heat during the power strokes. This tends to increase the temperature difference between the gases and cooling water. Moreover, the inevitable increase in wall thickness of large cylinders tends to decrease the proportional amount of heat absorbed by the cooling water and to increase, consequently, the temperature of the oil film. In other words, the greater the size of the cylinder, the more severe is the influence of temperature on the film.

Influence of Pressure

Leakage of compressed gases past the split of each piston ring, and more particularly past the clearance between each ring and its groove, causes pressure to build up behind the rings. Behind the top ring this pressure is greatest—although somewhat less than the pressure upon the piston head itself; behind each succeeding ring it is less; behind the last it is practically negligible—its whole intensity having been consumed in forcing gas through minute clearances. Piston rings, therefore—and especially upper rings—produce squeezing action which must be supported by the oil film. The lubricating-oil film, while still supporting the pressure of the rings, must also seal them against blow-by during compression and power strokes.

Selection of Lubricating Oil

High pressure and high temperature occur simultaneously in Diesel cylinders; and their combined action upon the lubricating-oil film under adverse conditions can result quickly in loss of compression, excessive wear, and consequent increased power and upkeep costs. It is evident, therefore, that the oil selected must quickly form and replenish its own

*Before annual meeting, A.P.I., Dallas. Author's title, "Lubrication of Solid-Injection Diesel Engines."

Engine room of pump station with auxiliary units in foreground

"WATER SHOPS" PLANT *of the Springfield Armory, home of the United States Government Springfield Rifle, where J. F. Barker designed the original Springfield Gas Machine and where years later was installed one of the first Gilbert and Barker Heat Treating Furnaces.*

Gilbert and Barker

Subsidiary: STANDARD OIL COMPANY (NEW JERSEY)

• • •

Manufacturers of Oil Burners—Oil Furnaces—Gasoline Pumps—Oil Dispensing Pumps—Storage Tanks for Petroleum Products—Air Conditioning Equipment—Domestic and Industrial Hot Water Heaters—Stove Burners—Side-Arm Heaters—Airplane Servicing Equipment.

IN 1889: For close to a quarter century the Springfield Gas Machine, manufactured by Gilbert and Barker, had proved its outstanding merit as a means of burning gasoline safely and economically for light and heat. With the gradual passing of the old industrial regime of hand craftsmanship and water power—and the dawn of the "machine age" and mass production at low unit cost—it was only natural Gilbert and Barker again turned attention to petroleum. Industries near and far raised the question of better, less expensive manufacturing processes. In the efficient combustion of oil Gilbert & Barker, in 1889, gave American industry the first of a number of highly satisfactory answers.

The Boston and Albany shops in West Springfield were the first users of a Gilbert and Barker industrial fuel oil burning system, which, in 1889, was of the high pressure type—air at 15 to 20 pounds was used for atomization, the oil being at a pressure of 10 pounds. Thus started the practical application of oil to metallurgical furnaces for heat treating, case hardening and annealing.

Among the first installations was that in the Water Shops of the United States Arsenal at Springfield, where J. F. Barker in 1865 started development of the Springfield Gas Machine.

L. S. Starrett Company—Brown and Sharpe Mfg. Company—Union Twist Drill Company—Greenfield Tap and Die—International Harvester—United Shoe Machine Company: these concerns were but a few of thousands (as far West as Denver) installing the first Gilbert and Barker industrial burner to convert coal and coke furnaces for oil firing.

IN 1908: Gilbert and Barker started production of complete furnaces designed purely for oil firing. Automobile makers were quick to appreciate the economy and efficiency of the new Gilbert and Barker Low Pressure oil burning system. Packard made a large installation in 1909. Locomobile—Knox—Lozier—Cadillac—Ford—Metz—Chalmers—Willys Overland—Hupmobile soon ordered installations requiring up to 500 burners. Applications of the new system spread rapidly, embracing the manufacture of silverware, vitreous enameled ware, and many other manufactured products.

In early 1916, 6,000 separate installations of Gilbert and Barker oil burning systems stood forth as proof of service and satisfaction rendered to American industry.

IN 1916: In the early days of the World War, manufacturers in the vicinity of Pittsburgh faced an acute natural gas shortage. Gilbert and Barker engineers responded by developing a combination oil and gas firing system for industry. This method of firing (used by Mills, Jones and Loughlin, American Steel and Wire, National Tube, and a majority of United States steel plants) allowed the simultaneous burning of natural gas and fuel oil, or gas alone, or of fuel oil alone according to prevailing supply of natural gas in a particular locality.

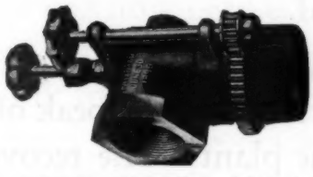
The World War also brought to Gilbert and Barker many orders for a special furnace for the production of shells. These were used by Frankfort, Springfield, and Watervliet Arsenals; Colt, Savage, Smith and Wesson and scores of other plants specializing in the manufacture of shells and light and heavy arms.

IN 1922: The fuel oil burning systems which had served American and foreign industries so well suggested to Gilbert and Barker the development of a fuel oil burning system which would serve American homes with equal efficiency. Experimentation and development were started with the idea of perfecting an oil burner which, when once marketed, would establish for itself a reputation comparable with that made first, by the Springfield Gas Machine, and second, by the Company's industrial fuel oil burning systems.

IN 1934: Few companies are so well qualified as the Gilbert and Barker Mfg. Company to produce an oil burner for domestic use. More than 40 years continuous practical experience with oil combustion problems (traced in this advertisement) represents a unique, probably unequalled background. While home owners do not check economy of operation and maintenance expense in the same thorough manner in which industrial engineers are compelled to, users of Gilbert and Barker domestic oil burners invariably discover the Company's domestic oil burning units establish an impressive record of economy and freedom from trouble.

Just as Gilbert and Barker fuel oil burning systems were sold to the most critical class of industrial consumers, so Gilbert and Barker domestic burners are, for the most part, sold to a type of consumer apt to be highly critical of results. The Gilbert and Barker domestic oil burner is not the cheapest burner on the market. Yet in each of the four years since the Company introduced its domestic oil burner, more and more purchasers have selected the Gilbert and Barker burner, forgetting mere price in the interests of dependability and period-of-time economy.

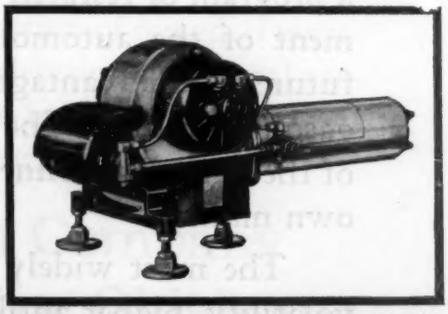
FIRST CAME THIS TYPE *Gilbert and Barker Industrial Oil Burner (1889). High pressure type. Converted coal and coke furnaces for oil burning.*



SECOND TYPE *of Gilbert and Barker Industrial Oil Burner (1908). Low pressure type. Used as part of complete oil burning furnace.*

THIRD TYPE—*Combination oil and gas burner developed in 1916 by Gilbert and Barker to solve problem of natural gas shortage faced by manufacturers. Burned the two fuels simultaneously, or either separately.*

GILBERT & BARKER METALLURGICAL FURNACES *have always been an important factor in the automotive industry. Above installation is Gilbert and Barker type C-117, double chambered, semi-muffle (combination gas and oil burners) in plant of The Pierce-Arrow Motor Car Company, Buffalo, N. Y.*



FOURTH GILBERT & BARKER CONTRIBUTION *(1930) to more efficient oil burning. Model JB Domestic Oil Burner, one of four types manufactured to meet various house heating specifications. Also for domestic use are (1) the new Gilbert and Barker Automatic Oil Heat Unit (complete oil furnace) and (2) Gilbert and Barker Conditioned-Warm-Air Unit.*

(THIS IS THE SECOND OF A SERIES OF ADVERTISEMENTS ON THE HISTORY AND GROWTH OF GILBERT AND BARKER MANUFACTURING COMPANY, SPRINGFIELD, MASS.)

To the Members of the
American Petroleum Institute,
Dallas, Texas

The natural gasoline industry is an integral and indispensable branch of the oil industry. Its problem is also the problem of the industry at large because the prosperity of one is directly affected by the prosperity of the other.

The oil industry is naturally concerned about the situation in East Texas but unless the natural gasoline industry also has the support of the refiners, and its place in their allocations, the plight of the natural gasoline manufacturer, who supplies one-tenth of the motor fuel consumed, will remain to disturb the oil business even if the trouble in East Texas were corrected tomorrow.

The facts have been presented at Washington but without receiving the consideration they demand. The natural gasoline industry has a right to inquire what it can expect, what is to be the attitude of the oil industry toward this Cinderella in its household.

The natural gasoline manufacturer is getting as low as 1¼c a gallon for his product, with the top at 3 cents during the peak of consumption. There can be no suggestion of closing up the plants. The recovery of natural gasoline is a proper and economic function as much so as any other utilization of our natural resources.

The product contains the most desirable properties required in motor fuel, and if not used in blending with refined products deficient in these qualities, it can be utilized as a stabilized motor fuel competitive at lower cost with refined gasolines.

The natural gasoline industry does not expect a premium price from refiners but when this tenth of the motor fuel supply is forced to distress levels it must upset the oil industry's principal market.

The Natural Gasoline Association of America has instituted and maintains a program of research designed to adapt its product to the progressive development of the automotive engine, keeping it distinctly the motor fuel of the future. The advantageous results of this research are available in the natural-gasoline product. The oil industry would not alone profit from the enterprise of the natural gasoline manufacturers but would at the same time stabilize its own market.

The most widely proclaimed characteristics of motor fuels are improved volatility, higher antiknock and greater power. Natural gasoline provides all

these qualities. The greater the improvement in the motor fuel the greater the need for natural gasoline to keep abreast of the procession.

If the refining industry makes an impartial analysis of the superior value of the natural product for premium qualities and realizes that so long as one-tenth of the motor fuel supply is treated as a distress product the whole market is endangered.

It has been a familiar axiom that the gasoline market is often determined by a floating five per cent. How much more so if ten per cent is involved, as with natural gasoline?

Here is something to think about. The highest estimate of over-production of crude in East Texas has been around 125,000 barrels a day. The "hot" gasoline represented by that over-produced crude has demoralized the market of the entire industry. Yet the volume of that gasoline is less than half of the natural gasoline output of the country offered daily.

The whole oil industry has been upset by the effects of "hot" gasoline from East Texas, which we all hope has now been eliminated by recent governmental action. Yet a larger volume of natural gasoline, one-tenth of the motor fuel supply of the county, is left to sink to what level it may. This, too, despite the fact that any weakness in the natural gasoline market is an unfailing precursor of weakness in the refined market. Would it not be wise to consider a buying program for natural gasoline, not only as a matter of self-defense but because its real value to the industry is worth it?

If all the major companies were able to use even as little as two per cent more natural gasoline in their operations they would entirely eliminate the natural gasoline over supply. Some companies are using ten per cent today with excellent results. California uses as much as 17 per cent.

The two arguments are irresistible; the availability of a superior product of essential qualities at a less cost, and the removal of weakness in the market structure which must be eliminated before any sort of permanent stabilization of the oil industry is attained.

May we call your attention to the fact that any discussion of remedial measure as applying to the oil industry which omits the consideration of natural gasoline is incomplete, and will leave a major problem to be solved by hard unplanned economics—to the detriment of the whole industry.

Warren Petroleum Company
Tulsa, Oklahoma

lubricating film; it must have those special properties whereby a mere coating upon cylinder walls will have sufficient film strength—even when exposed to high combustion temperatures—and will resist the pressure that necessarily acts upon it through the piston rings; it must at all times maintain an effective piston seal. It must accomplish these things under most severe operating conditions, i. e., at the combustion ends of the cylinders, where temperature and pressure are greatest, and where wear is always first detected. It is only by maintaining an effective film at all points upon cylinder walls that Diesel engines can operate continuously and economically.

Influence of Distribution, Carbon, Fluid Friction, on Selection of Lubricating Oil

Distribution of oil film, carbon formation, fluid friction of oil, all have a definite effect upon economical Diesel performance. In addition to pressure and temperature, therefore, these factors must also be considered in selecting suitable cylinder oil.

In general, too heavy an oil will not distribute readily; it must be fed liberally in order to prevent dry spots on cylinder walls. Light oil is quickly distributed; but too light an oil will not resist ring pressure, nor will it provide adequate piston seal; wear and blow-by will result unless the oil is fed in large quantities. Over-lubrication of this sort can result only in excessive carbon formation and consequent trouble.

When cylinders are supplied by a mechanical force-feed lubricator, distribution is assisted by a plurality of points of application. If these points are far apart, the adjacent wall surfaces must receive excessive quantities of oil in order that sufficient lubrication may reach more distant surfaces. In certain types of engines, therefore, the fluidity of the oil must be adapted to the distance between these points of introduction, in order to assure complete distribution without excessive feed and undue carbon.

Excessive deposits in piston-ring grooves interfere with the functioning of the rings; they are a direct cause of blow-by and an indirect cause of film destruction and consequent severe wear. On valve seats and spindles they interfere with seating, and cause leakage and loss of power.

When deposits result from carbonization of lubricating oil at high-cylinder temperatures, the cause can be traced either to inferior oil or to excessive feed of even high-quality oil. If these deposits are to be minimized, it is of the greatest importance that proper oil be used—taking into account its character, the crudes from which it was made, and the method of its refining. It is equally vital that the feed be reduced to the bare minimum required to form and maintain the essential oil films.

When cylinders are lubricated by oil thrown from the bearing system, operators have no control over the rate of feed. This condition is found usually in small high-speed engines, in which dependable oil supply to cylinder walls is assured by this liberal method of furnishing it. Baffle plates or special scraper rings help to keep excessive quantities of oil from reaching the walls and over-lubricating them; but it is also of vital importance that the oil selected should have sufficient body to reduce the throw to the walls to a proper amount. In addition, the oil should be of a character that will assure effective lubrication with minimum carbon.

Fluid friction, of course, plays an important part in the lubrication of those Diesel cylinders having long trunk pistons; but even here the necessity for preventing to the greatest extent excessive wear and for maintaining perfect piston seal is still paramount. Furthermore, the question of oil distribution, which tends totward the selection of the lightest oil suited to operating temperatures and pressures, results also in a reduction of fluid friction as much as it is possible to do so.

Correct lubrication of Diesel-power cylinders, therefore, implies the furnishing of a lubricating-oil film that will prevent metal-to-metal contact, and assure perfect piston seal with minimum carbon formation. It is impossible to expect that any one brand of oil will serve with maximum efficiency over the wide range of sizes and systems of lubrication found in Diesel engines. We can, however, express the requirements of Diesel-cylinder lubrication in the following terms: that the lubricating oil shall have characteristics that will give its film sufficient strength at the high temperature and pressure to which it is exposed; that it shall have a fluidity that will permit ready distribution; that it shall be able to resist the formation of carbon deposits.

Bearings

No metal surfaces under pressure, such as journal and bearing, can rub on one another even for a short time without generating excessive heat and eventually destroying the material. It is necessary to separate such surfaces by a film of lubricating oil.

Diesel engine driven centrifugal pumps in pipe line station

Oil-Wedge Principle

In a Diesel bearing, separation is easily attained when lubricating oil—adhering to the journal—is drawn in the form of a wedge into the pressure area.

Where motion is very slow—as at starting—or very limited—as in the oscillation of piston-pin or cross-head-pin bearings—there is a tendency to squeeze the oil film out of the pressure area. Size of bearing, unit pressure, and oil temperature influence the resistance of this film to squeezing action. The extent to which an effective film can be maintained under any set of operating conditions depends upon the film strength, body, and certain other characteristics of the oil.

One oil is generally used for all bearings of a Diesel engine; the oil selected must be suited to those bearings subject to severest operating conditions. Size, speed, pressure, and temperature of bearings are controlling factors in selecting an oil that will form an effective oil wedge; but method of application may influence the choice of body or other characteristics and is, therefore, an additional factor for consideration in the final selection of Diesel bearing oil. Circulation oiling, which is used on the majority of Diesel engines, provides a liberal supply of oil for lubrication; and the consequent flooding assures an adequate oil wedge, besides assisting materially in cooling.

Oxidizing Influences

In circulation-oiling systems, oil escapes from the ends of bearings, and is whipped about the crankcase until it is broken up into a fine spray. Contact of this spray with hot air in a crankcase is favorable to oxidation, especially in the presence of water and other impurities. Constant churning accelerates this oxidation, promotes emulsion, and altogether has a very detrimental effect on lubricating oil.

Other Influencing Factors

Depending upon design, impurities from other sources may place further serious burden on circulating oil. Leakage from water-cooling systems, deposits from cylinder drip, dust from intake air, fuel—any or all of these may contaminate the oil in a crankcase.

Where pistons are oil-cooled, part of the bearing oil—circulating through the pistons—comes into contact with the hot piston heads. Exposed to this high temperature, the oil must resist to the greatest extent any tendency toward breakdown; otherwise the formation of deposits at this point will prevent effective cooling, and may produce excessive heat stresses that will even crack the pistons.

In order that bearing oils may resist these severe operating conditions, special care must be exercised in the selection of crudes—and equal care and skill used in their refinement.

Results of Oil Breakdown

Inferior or unsuitable bearing oils break down readily, and this condition manifests itself in the precipitation of gummy deposits. These may be present even when the oil appears to be in fairly good physical condition. When they lodge within pipes or ducts leading to bearings, they become a source of imminent danger—although their accumulation may not be noticed until sudden restriction or stoppage of oil to some bearing or group of bearings results in serious consequences.

Effect of Oil Body

Formation of an oil wedge and maintenance of an oil film are affected also by the body or viscosity of lubricating oil. With too heavy an oil, not only is fluid friction abnormal and consequent bearing temperature excessive, but separation from inevitable impurities within an oiling system is made difficult. This lessens the life of the oil. When too light an oil is used, the film is not viscous enough to keep metal surfaces apart; rapid wear ensues, and sometimes burned-out bearings. Moreover, too light an oil is readily atomized while escaping from the bearings, and the intimate contact of this spray is favorable to oxidation. Too light an oil often results in excessive consumption; but this depends to some extent also upon design and operating conditions, and upon the opportunities for leakage.

Automotive (High Speed) Diesels

The development and rapid growth during the past few years of the high speed Diesel has stressed the need for quality lubricants to a point where leading refiners have devoted a great deal of effort to the production of improved lubricants to meet the demand.

The circulation system for the bearings of a large slow-to-moderate speed engine has a capacity of several hundred gallons. The rate of circulation is comparatively slow, and generally some method of oil clarification is furnished with the engine. Oil coolers are usually incorporated in the system. Crankcase temperatures in these large units are moderate (generally, less than 120° F.). In considering the high speed Diesel, however, it must be appreciated that high crankcase temperature is one of the most potent factors in the oxidation of lubricating oil.

Complete combustion of fuel is far easier of attainment in the moderate-speed unit than in the high speed engine, by reason of the time factor. An engine operating at 250 r.p.m., for example, has about one-eighth of a second to inject, ignite, burn the fuel, and expand the gases of combustion; whereas an engine of 1,000 r.p.m. must go through this cycle in one quarter the time, or one-thirty-second of a second. Incomplete combustion, especially in the high speed units, places a severe burden on the lubrication oil, due to greater contamination.

The high-speed engine naturally has a high horsepower output for its cylinder size. Add to this a small oil capacity (about five gallons for an engine of 100 horsepower), a hot crankcase (sometimes 200° F. or more), inadequate oil-cooler capacity, fine atomization of oil from the rapidly revolving crank into the hot crankcase air, mediocre oil clarification—and it will be appreciated why oils which have in the past been excellent Diesel engine lubricants may be inadequate for this group.

Operating troubles resulting from combustion difficulties and lubricating oil failures are so interrelated that it is difficult to isolate them. However, if a lubricating oil is used which resists to the maximum degree any change in character during operation, then the user is assured of minimum trouble in the form of excessive sludge in crankcase and stuck piston rings and valves, insofar as the lubricating oil can be a contributing cause.

All the high speed automotive Diesels and many stationary engines are designed to use the same oil for cylinder and bearing lubrication, the cylinders receiving their supply by oil thrown from the revolving cranks.

Knowing that only thin films of lubricating oil stand between efficient operation and serious failure, it becomes of the greatest importance that oils for Diesel circulation systems should satisfy the most severe requirements in order to assure reliable operation. They should possess, in addition to the characteristics specified for power cylinder oils:

a. High chemical stability: A valuable characteristic, by which certain oils resist the destructive influence of continued circulation with solid and liquid impurities, and of agitation in the presence of air. This characteristic largely determined the durability of an oil, and can be attained only in those high quality oils especially refined for this purpose.

b. Ability to separate readily from solid impurities and water: It is this property which guards against the formation of sludge and emulsions, and which protects bearings from the inevitable destruction that occurs when such impurities, together with broken down products of unsuitable oils, clog the oil pipes and eventually shut off the oil supply.

c. Correct body and fluidity by which is assured the maintenance of effective lubricating oil films under the most severe operating conditions.

These characteristics are attained to a high degree only through the skillful selection of petroleum crudes, and through scientific planning and execution of refining processes—with the sole aim of developing these desirable properties to the highest possible degree.

First Things Not Put First in Oil Code President A. J. Byles Tells Institute

By AXTELL J. BYLES
President, American Petroleum Institute*

From an altruistic standpoint, it is the duty of every business to view its problems and its acts in relation to the national welfare. There are times, and this is one of them, when it requires no great wisdom to indicate that self-preservation adds impetus to altruism.

We must not be unmindful of the conditions which made it seem advisable to the President and the Congress to enact the National Industrial Recovery Act and set up the code system in the belief that thus relief could be most speedily afforded a distressed people. It ill benefits the circumstances for us to befog our minds or expend our energies in destructive criticism or to lament unrealized hopes. If we can view our problems objectively and act accordingly, dividends in the form of experience may, to a considerable extent, offset the cost of the errors committed. We have reached the point where candid expressions of opinion, as well as calm thinking, becomes the obligation of anyone who speaks. Throughout the remarks which are to follow I propose to discuss measures, not means; policies, not politics. It should be understood that I am speaking to, and not for, the members of the Institute, and that I am not challenging the motives or questioning the sincerity of anyone who has had to do with the administration of the petroleum code.

The Public Interest

I shall endeavor, in this discussion, to keep ever in mind and to be guided by what I conceive to be the public interest. The public interest requires an adequate supply of petroleum products of good quality at reasonable prices and conservation of an irreplaceable natural resource. In order that the public interest may be served, the industry must be able to pay reasonable wages and make reasonable profits.

Disagreeable Facts

At the outset it may be helpful if we recognize certain disagreeable facts. Among them, that under the code we have not put first things first. Because an overbuilt industry—already in distress from excessive production and inventories, as well as from bad marketing practices—faced additional expense for labor and materials under the code, an attempt was made to build a superstructure of price without a supporting foundation, forgetful that profits cannot be given but must be earned. As a result of this concept, too little attention has been paid to fundamental, practical problems of policy; too much attention to theorizing and improvizing well-intentioned but futile efforts to relieve each individual and collective ache and pain and still the cries of distress throughout the length and breadth of the land. Each artifice and palliative has called for another. In other words, both the so-called code authority and the administrative authority attempted to attain the unattainable and enforce the unenforceable. Experience has indicated that reams of paper plasters in the form of and relating to orders, interpretations, modifications, and rules, had little, if any, healing effect.

*Delivered at annual meeting, A.P.I., Dallas.

The Retailing Frankenstein

The most overbuilt branch of this overbuilt industry is very obviously that of retail marketing. Service stations have become so numerous that thousands of them have become dis-service stations, inimical to the public interest through increased cost of distribution and destructive to those engaged in the business through application of the law of diminishing returns. The parents of this Frankenstein were those, whoever they may have been, who first began furnishing free service station pumps and tanks with the commendable thought of thus protecting the public against substitution and themselves against loss of retail outlets. From the day of its birth, the appetite of this monster has been insatiable. He has demanded and received hundreds of millions of dollars worth of free equipment and perquisites and, having waxed fat on these, demanded and received ever widening margins upon which to feed. In his growth he destroyed gallonage, per pump, through demanding and receiving more pumps. His is the maw into which is poured gasoline made from cut-price illegally-produced crude and gasoline which has evaded the tax collector. Still unsatisfied, he has demanded and received sustenance from his price-cutting keepers in the form of gasoline supplied to them by the very manufacturers who have their own retail outlets to protect and which are thereby being destroyed.

Law of Diminishing Returns

This Frankenstein, conceived in such high hope, instead of leading marketers into the Elysian fields, has turned on them, threatens to destroy them, and is marching back along the trail, through the refineries to the oil wells themselves. Indispensable as balance of supply and demand is to a stabilized industry, it has become apparent that, in addition to this, certain marketing policies must be revised and certain practices discontinued. There is an uncomfortable similarity between some of our retail marketing practices and those of the old beer saloon, where equipment and other perquisites were furnished free of charge by the brewer until saloons occupied three out of four of many of the corners in the country. The law of diminishing returns applies to gasoline service stations, corner groceries, and other vendors of goods.

Correction of Marketing Abuses

I have not heard anyone offer a complete and satisfactory solution to this problem. No perfect solution is likely ever to be found. None, I apprehend, will be found which will effect an immediate cure. I desire, however, to call your attention to certain rules already in the marketing section of the petroleum code, namely: (1) Those that prohibit the giving, loaning, or repairing of service station equipment, the giving of service station improvements, premiums, etc.; (2) the rule making it possible for the refiner of branded petroleum products to see to it that the reseller disposes thereof at the refiner's posted tank car and service station prices. This rule may not include unbranded products. If not, it should be so amplified as to include them.

If the rule against loaning of equipment and similar practices is observed and the rule making the refiner responsible for the resale of his products at his (nobody's else) posted prices is invoked, we will be on the way to correct two of the worst abuses in marketing.

It may be argued with considerable force that the rule enabling one to be responsible for the resale price of his products cannot be applied so long as "hot" gasoline is poured into the market. I doubt if this argument is wholly valid. This doubt is based on the belief that, if there is a real desire to do so, the rule may be invoked as to all accounts, excepting those which have to meet cut-price competition from vendors of illegal goods. In the latter case price should meet price.

Regardless of the many loose statements made to the contrary, I do not know of an individual or a company in the business who would derive any pleasure from driving a competitor out of it. All naturally desire to live. If, however, one operator, in order to procure gallonage, in an effort to lower his cost and to enable him to sell profitably at lower prices, posts 12 cents a gallon for gasoline when his competitors are posting 15 cents, the latter have to meet the lower price or lose their business. The retail gasoline market is, figurately speaking, as subject to the law of gravity as the product itself, and the consuming public is quite naturally going to seek the lowest level. As stated before, it is in the public interest to permit it to obtain the best products at the lowest prices which will enable the industry to fairly compensate labor and earn a reasonable profit. It is against the public interest for situations to develop which destroy sound and efficient operations.

Dealer Margins

The practices above referred to have led to ever-widening margins. This trend has been augmented under the code to meet increased labor costs. Unfortunately, however, wider margins have not always gone for the purpose intended, and have resulted in a more rapid increase in the abortive growth of service stations and encouraged price wars. It must be apparent to all, whether they like it or not, that these margins must be reduced to sound levels. Not so long ago a 2-cent margin was adequate for the operation of a filling station, then doing a larger gallonage, and netted more to the operator than he now receives from a 4-cent margin. Unless this fever is abated, it will not be long before the average filling station will make less or lose more money on an 8-cent margin than it now is making or losing on a 4-cent margin. The recent adoption by some companies of a sliding scale of dealer margins, so that as prices drop the dealer will absorb a part of the cut, is a step in the right direction. Is it too much to hope that we may see the day when such a thing as a guaranteed profit is unknown in this industry, and when we will see manufacturers supplying fewer grades of domestic motor fuel. The sooner third-grade or so-called "fighting brands" are eliminated, the sooner costs of distribution will be lowered and this very prolific field of uneconomic competition destroyed.

Readjustment for All Classes

Any analysis of retail marketing simply leads to the conclusion that there are too many retail outlets to permit either profitable or low-cost distribution, and possibly to the conclusion that a substantial write-down of investments in high-priced service station properties may have to be considered. Readjustment is on the way, and is not going to fall exclusively on any one class. In one form or another it will be borne by all. A very large percentage of the gasoline produced is supplied by the refiners to nonintegrated independent outlets which are operated by capable, high-class merchants who desire to see the business put on a sound basis. If a word of admonition is not out of place, I would suggest that supplier, distributor and reseller work closely together in an endeavor to solve their common problem.

Four Marketing Rules

The Planning and Coordination Committee, in preparation for the expiration of the National Industrial Recovery Act, has inaugurated among its subcommittees a study of the present petroleum code with a view to simplification and clarification. I think most of us agree that a code which does not have the sanction of the industry will neither be universally observed nor can it be enforced. Such compliance as there is on the part of the right-minded and responsible ties their hands, while the wrong-minded and irresponsible pick their pockets. In view of this situation, I suggest that if we are going to continue under a code at all, we consider confining the marketing section to four rules: (a) One requiring the posting of prices, both retail and tank car; (b) one forbidding the loaning of equipment, etc.; (c) one against the procurement of violation of competitors' contracts; (d) one making each refiner, distributor, jobber and wholesaler responsible for the resale of his products at his (and nobody's else) posted market price.

Crude Oil Supply and Control

Let us now turn to the subject of crude oil supply and control.

This problem is different from that involving any other raw material because of petroleum's fugitive character when disturbed in its underground reservoir. It is involved and made more difficult by the law of capture. This law, as we all know, was made many years ago by judicial decision based upon error in understanding, on the part of the industry and courts, as to the nature of underground storage. The error should long since have been corrected and the law of capture abolished.

Loss of Perspective

While it is a fact that each petroleum pool and strata exhausted means one less in reserve, I am wondering if we are not stressing conservation to the point of losing perspective. Oil fields are not exhausted over night. Certain fields continue to produce for 20 or 30 years, and in exceptional cases have been producing for upwards of half a century. Technique in the discovery of petroleum and the production of it from ever-deeper levels moves on apace. Short of 100 per cent, there is practically no limit to the proportion of gasoline which modern and constantly-improving equipment and processing can extract from a barrel of crude oil. Internal-combustion engines now operate efficiently on lower-grade products. Technical men advise us that we are utilizing but 5 per cent of the power contained in a gallon of gasoline; that complete utilization of this power would propel a small motor car, on a smooth and level road, a distance of 400 miles. Here is a field of scientific adventure with almost incalculable possibilities. There are vast supplies of oil in shale and coal. These statements illustrate a

(Continued on Page 90)

Control of Gasoline Production Analyzed by Chairman of Board

By W. R. BOYD, Jr
Chairman, Refinery Board of Review
Executive Vice President, American Petroleum Institute*

A committee on petroleum economics of the Federal Oil Conservation Board initiated, in April, 1930, a program of making forecasts of national requirements for gasoline and the amount of crude production necessary to meet the demand. Thereafter, committees of that board and of the American Petroleum Institute, acting independently, continued to make these forecasts until the middle of 1933 when they were abandoned because the petroleum code had become operative.

These forecasts began and continued during a severe general business depression and concerned an industry with excessive plant capacity, large inventories, and an enormous over drilled-up potential supply of raw materials. These committees adopted the general theory that the levels of the national and the several refining district gasoline inventories constituted the best single criteria of economic operation. The Institute committee urged repeatedly that, regardless of the correctness of any series of estimates of production and shipments, it was beyond disputation that a balance between supply and demand may be struck if adherence be maintained to schedules of predetermined economic stocks. The first committee of the Federal Oil Conservation Board expressed the opinion that curtailment of current supply was an emergency measure only and not a permanent cure for maladjustments existing in the petroleum industry arising from overdevelopment, overcapitalization, which rested on an unsound method of competition in offset drilling and that until these maladjustments were cured by restriction of drilling, abridgment of plant expansion and recasting of crude production methods, curtailment could at best be but an expediency.

The work of these committees and their demonstrated ability to forecast with a remarkable degree of accuracy the national consumption of gasoline, provided the necessary background for the development of our present so-called refinery control program. Without this background of experience the refining industry would have found it very difficult to accept any kind of control program.

After it was determined that I should appear on this program, I prepared a speech expounding my conception of the economics involved in the production and sale of gasoline and an analysis of the theory on which our present refinery control program is founded. I did it because the improved statistical position of gasoline inventories had not been followed by the expected upward price move. My investigation led me to some conclusions which I thought might be presented profitably upon the theory that sometimes a short speech by even a child is more eloquent and provocative of thought than a long and profound oration by one of his elders. But, after some debate with myself, I came to the conclusion that my voice was entirely too faint in the determination of petroleum industry policies to offer advice which might provoke much more controversy than thought; therefore, I decided to eschew today any public excursion into the realm of economics and to confine myself chiefly to giving you some information and comment about the operation of the present so-called refinery control program to which the industry committed itself by code provision on April 24, 1934.

*Before A.P.I., Dallas, Tex.

Agencies and Functions

Describing the several agencies and their functions in the machinery of gasoline production control, these are:

First, the Oil Administrator. It is his privilege to divide the country into refinery districts; to approve or disapprove appointments made by the Planning and Coordination Committee of the national co-ordinator and the members of the Board of Review; to determine (1) the proper inventories of gasoline for the country as a whole, and (2) the production of gasoline in the country necessary to meet the demand therefor; and to act as the final arbiter or court of appeal from any formal action taken by the Planning and Coordination Committee in connection with the allocating program. The determinations with respect to inventories or production when, if and as fixed by the administrator may not be exceeded by the industry.

Second, the Planning and Coordination Committee. Its functions are: To appoint a national co-ordinator, and the members of a Board of Review; to appoint district allocators or designate other refining district allocating agencies; to approve or disapprove the joint action of the national co-ordinator and the district allocators in fixing the district allowable share of the authorized national production quota; to act as the next highest court of appeal from decisions of the Board of Review; to prescribe the rules and regulations for making allocations and requiring reports; to authorize withdrawals by or for refiners of crude oil from storage; to authorize suitable arrangements for the purchase of gasoline from non-integrated or semi-integrated refiners and the resale thereof through orderly channels; and to establish quotas in commerce for gasoline to be moved from all or any of the refineries or other sources of supply in any district when there is excessive supply or excessive inventories which are calculated to injuriously affect interstate and foreign commerce.

Third, the National Co-ordinator. His function is to act jointly with the district allocators and determine from time to time (1) the proper inventories for each refinery district, and (2) the production of gasoline in each district necessary to meet the demand therefor; to approve or disapprove for refiners operating refineries or maintaining gasoline inventories in more than one refining district, transfers of such refiners own production allowable or inventory from one district to another in order that district allocations may be adjusted in such manner as to meet equitably the consolidated requirements of such refiners; to meet with the district allocators when necessary to provide appropriate co-ordination between districts and uniform application in each district of the rules and regulations prescribed by the Planning and Coordination Committee; to receive currently from each district allocator or allocating agency a complete statement of the allocations made to each refinery in the district; and to advise with respect to applications for withdrawals of crude oil from storage by or in behalf of refiners operating refineries or maintaining crude oil inventories in more than one refining district.

Fourth, the District Allocator or District Allocating Agency. It is the function of the district allocator to co-operate jointly with the national co-ordinator and other district allocators in (1) fixing the proper inventories of gasoline for each district and (2) the production of gasoline in each district necessary to meet the demand therefor; to establish, within the limits of the district operating schedule fixed for the refining industry in his district, a fair and reasonable quota for each refinery in his district; to advise with respect to applications of refiners for withdrawals of crude oil from storage; to make currently reports to the national co-ordinator of the allocations made to each refinery; to observe the rules and regulations prescribed for guidance of district allocating agencies; and to meet and co-operate with the national co-ordinator when necessary to provide co-ordination between districts and uniform application and observance of the rules and regulations prescribed or authorized by the Planning and Coordination Committee. In making allocations to refineries, the code requires the district allocator to take into consideration relevant features of operating and marketing conditions in accordance with rules prescribed by the Planning and Coordination Committee and approved by the administrator.

Fifth, the Board of Review. The code says "that any person may appeal from any recommendation, allocation or decision of the district allocator, agency designated by the Planning and Coordination Committee, agency established by the refinery district committee, or the national co-ordinator, to the Board of Review, and the decision of said Board of Review shall be final, subject to the right of the Planning and Coordination Committee to review such decision upon appeal, which committee's action, either in respect to the exercise of such right or in respect to the determination made if such right be exercised, shall be subject to the approval of the administrator."

Section 10, of Article 4 says: "In case of any appeal, the appellant shall abide by all the provisions of the article and the rules and regulations issued thereunder pending the decision of such appeal, but in case the contentions of the appellant are upheld in whole or in part, an order shall be issued which shall be retroactive to the effective date of the order appealed from."

Powers of the Board

Counsel for the Planning and Coordination Committee has held that the Board of Review is empowered upon its own motion or upon appeal (a) to review and revise and order increases or decreases of the gasoline production quotas fixed for refinery districts; (b) to review and revise and order increases or decreases of the gasoline production quotas for individual refineries fixed by any district allocator or district agency; (c) to review and revise any action of the national co-ordinator; and that in doing so the only limitation is that the board may not increase the total allowable national production figures fixed by the Federal agency for the country as a whole.

Counsel stated that this board exercises independent functions and makes independent decisions which may not be set aside by any other agency except upon appeal in the manner provided in the code. In his opinion a decision of the Board of Review is a final decision, subject only to the right of the Planning and Coordination Committee to review such decision upon appeal; that such a decision is not a recommendation to the national co-ordinator, nor to the district allocator nor to a refiner nor to any one else but that it is in itself an effective operating order which justifies the person affected in immediately carrying out such order until the same be upset by an appeal direct to the Planning and Coordination Committee.

The Board of Review holds monthly sessions. Public hearings are held when requested by any one appealing. Its decisions are recorded and made public through written opinions available to any refiner. It has functioned for six months. It has held five regular monthly sessions and one special session in Washington. Its sixth or regular November monthly meeting was held in Dallas last week. At its first five regular sessions, it acted upon 137 appeals of which 57 were granted in whole or in part and 80 denied. The original quota fixed in these 137 appeals aggregated 37,620,517 bbls. The total of increases requested was 7,546,341 bbls. The total increase granted in the 57 appeals sustained by the board was 1,765,859 bbls.

Regimenting Refinery Operations

The function of each agency provided for has been set forth here partly to inform refiners and in part to point out to producers and marketers the extent to which the refining industry has gone in regimenting its refinery operations. That the code contemplates taking from the owner and the management the right or privilege to direct certain operations is clear and unmistakable. The objective, of course, is commendable, namely, to effect stability of the gasoline market.

The code, of course, is assumed to be law until set aside by some competent authority, nevertheless, the functioning of any refinery control program will always be dependent on the voluntary rather than the enforced support of refiners. It is clear that voluntary support can best be had by having the system operate out in the open with all the cards face up on the table in order that refiners may know or at least have opportunity to judge for themselves that equity is being done and that no favoritism is being shown. Secrecy anywhere in the conduct of the allocation procedure will, in my judgment, do more to break down voluntary co-operation than all else combined. I have particularly in mind the district allocation procedure where quotas are fixed for each refinery.

The status of the Board of Review in the allocation procedure is unique. It seems to be that of a sort of keystone in the arch intended to oversee the whole machinery for making allocations, having all of the inquisitorial powers of a grand jury, and authority to make decisions to prevent discrimination or violation of the rules of procedure and equity.

The Board of Review, of which I am the chairman, is the only part of the petroleum code machinery with which I have had the privilege to in any way

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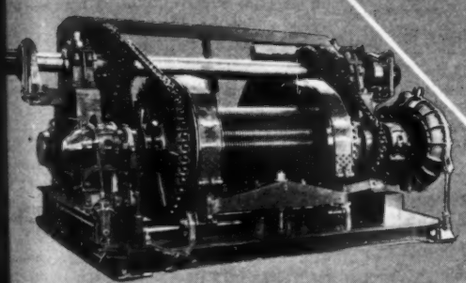

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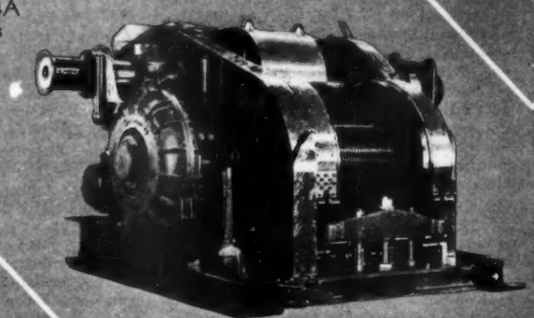

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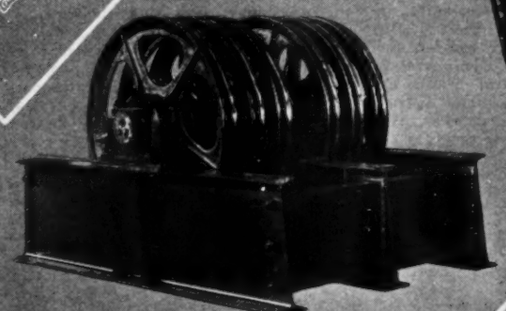

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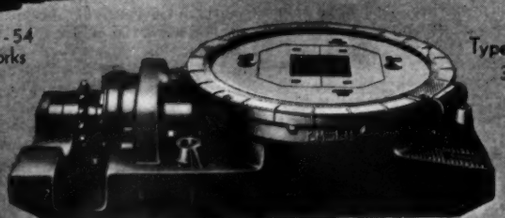

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be officially connected. It has a difficult and at times a most disagreeable task to perform. It does not make the rules and regulations nor the formulas for making allocations. The formulas are not uniform. There is no control over individual refiners' sales policies or programs. The board cannot take any action which will increase the aggregate national production fixed by the administrator which means that it cannot on an appeal allow more gasoline production than that fixed for one district without taking it away from another district and that it cannot increase the production allowable for a refiner without taking it away from other refiners in the district. The board has nothing to do with making the shoe pinch; all it is supposed to do is to see that when the shoe does pinch, it pinches all alike. The board has no police powers and it has no way to compel any refiner to observe the allocation given him by the district allocator or that amount fixed by its own decision. Yet it appears to have been the purpose of the code that the Board of Review should see that everything is done properly and equitably all along the line and that every one shall be made happy about it.

Refiners May Appeal

Refiners have appealed to the board admitting frankly that no discrimination has been made against them in making allocations but insisting that they be given the right to produce more. In many instances, if the board should grant an appeal of the character indicated the result would be to create an inequity and discrimination against the other refiners in the district. The purpose of the control program is to reduce inventories and production of individual refiners and such a program necessarily involves pinching until it hurts. The first test that the Board of Review must apply is whether the appealing refiner has been discriminated against or whether he got an even break with his competitors in the division of the production allowed for that district.

When a refiner makes an appeal it is because he is dissatisfied with the quantity allocated to him. If the board denies his appeal, he does not like it and, therefore, he complains. The proper procedure in every event is to carry the appeal from the Board of Review to the Planning and Coordination Committee in the manner provided for in the code. If he fails there, then he still has left the right of appeal to the administrator. Oftentimes when the board grants an appeal, other refiners in the district complain about our having done so. The members of the board know they are on the spot and the target of criticism. This is inevitable. In my 15 years connection with the Institute, I have at all times made a sincere and honest effort in the conduct of my activity to avoid playing favorites among the oil companies. You will have to be the judge of how well I have succeeded. I hope I may complete my probably brief service as chairman of this Board of Review free of any such charge. If I cannot, then I shall regret ever afterward having served. I have seen no evidence whatsoever that the other four members of the board are rightfully open to any such charge either. We are human and, being human, we are at all times likely to err. I here and now give the refining industry my assurance that the Board of Review as now constituted cannot be influenced by so-called high pressure methods or influence and that it expects at all times to hew to the line, letting the chips fall where they may regardless of who or what refining company or whether it be a big one or a little one that is before it with an appeal or complaint. For any one to ask or expect us to do otherwise would be asking us to be unfair and unsportsmanlike and to make a mock court of what is intended seriously to be a court of equity; and for us to do otherwise would properly subject us to the ridicule and condemnation of all right minded men. None of this is said in defense of ourselves nor is it said in criticism of any one else but we are all likely to visualize each other through the wrong end of our own little telescope. What I have said is said as the basis for a plea for tolerance, good sportsmanship and cooperation in support of the so-called refinery control program and those who are trying earnestly to make it work for the benefit of all.

The refinery control section of the code actually began to operate in the month of June. During the months of June, July and August, according to Bureau of Mines figures, gasoline inventories for the country as a whole were reduced, the total stocks, not including natural gasoline figures, dropping from 64,538,000 bbls. as of May to 55,297,000 bbls. as of the end of August, an overall reduction of 7,656,000 bbls. of finished and 1,585,000 bbls. of unfinished or an aggregate stock reduction of 9,241,000 bbls., or 14.32 per cent for the three months period.

The Economic Situation

Earlier in my remarks I indicated that I had been conducting some economic studies because our improved gasoline statistical position had not been followed by an expected upward price move. I am not now going into any general discussion of economic law but I do wish to comment briefly upon the price situation.

Of course, it is a fundamental economic rule that a rise or fall of the demand or supply curve for gasoline involves a rise or fall of the demand or supply price but it is equally true that this general rule is modified by another, namely, that we cannot regard the condition of supply by an individual refiner as typical of those conditions which govern the general gasoline supply in a market. In other words, the general rule that the aggregate production for a general market is the outcome of the motives which induce individual refiners to expand or contract their operations must be reconciled with the fact that the relations between the individual refiner and his special market differ in important respects from those between the whole number of refiners and the general gasoline market. This may be expressed still another way by saying that the causes which govern the facilities for production at the command of a single refiner conform to quite different economic laws from those which control the whole output of an industry, and that the gasoline supply curve of an individual refiner must be coupled with the demand curve of his own particular market and not with the general demand curve of a national or district market.

When business is slack or a refiner is losing gallonage or he is ambitious to increase his own demand or business, even though his total inventory and production is but small in relation to the total national or district quantity, he, because of lower cost or for any other reason he may choose to select, offers for sale a quantity of his gasoline outside his regular market at prices that net him a smaller margin of profit or little more than cover his prime costs or even lose him money. In doing so, he, of course, spoils not only his own regular market but the common market of all. He becomes a price leader; others follow him and a new and reduced price structure is established even though the general statistical picture remains unchanged or even is improved, as has been the case over the past few months.

We must not, in making programs, overlook the fact that the history or the actions of the individual refiner cannot possibly be made into the history or actions of the entire refinery industry any more than the history of an individual man can be made into the history or actions of mankind as a whole.

The normal price level of gasoline is that which economic forces bring about in the long run as distinguished from the so-called "short-period" demand. It is the average price which economic forces would bring about if the general conditions remained stationary for a run of time long enough to enable them to work out their full effect. The fact that individual refiners will not permit conditions in the gasoline markets long to remain stationary is the undoubted source of much of the difficulty we have in trying to apply our general economic rule. Economically speaking, the influence of the cost of gasoline production on price does not show itself clearly except over relatively long periods of time and it must be estimated with regard to the whole process of gasoline manufacture over this long period rather than by any particular quantity or the cost of any particular quantity of gasoline produced.

Many Conflicting Factors

The oil industry is a cross section of mankind, a widespread business undertaking composed of individuals and corporations striving, hoping and working in the belief that the services rendered will return a profit. The oil industry is a natural resource industry and, therefore, is compelled to reconcile nature's laws with man-made laws while simultaneously trying to reconcile the conflicting viewpoints and aspirations of the thousands engaged in the business. Its mechanism runs with considerable creaking, groaning and complaining but it runs with amazing speed. The oil industry, like the human race, is possessed of almost incredible vitality.

The economics of such a far-flung industry is difficult for any man to understand. It is a farcical idea that anyone can possibly possess all the information, knowledge and breadth of experience to enable him to make all the decisions about what should or should not be done. Human powers have no such versatility or extent. It takes courage for any oil man to decline the opportunities offered to have the Government assume part of his burdens and give him what appears on the surface to be something for nothing and all arguments for government regulation on control of one sort or another have an emotional drive behind them.

Advance in Technical Production

The first principle of architecture is that a building shall be of the utmost adaptation for the purpose it is designed to serve. The greatest economic progress of the last two centuries has been mainly in lines of technical production. The production of a manufactured product, of gasoline, if you please, is largely a problem of the technical arts; its distribution is one of social economy. The remarkable adjustment of petroleum refining to the needs of the consumers has been brought about by individual actions and motives under a competitive system not dictated to by central authority and mandate.

The dominant place of the competitive system in industrial affairs is not an accident. It is the result of unending experimentation with different methods carried on since the organization of civilized society. Government permission under proper supervision to do something is desirable but government compulsion to do the same thing is another story. Benjamin Franklin once said it was better to teach a boy how to shave himself than to give him a thousand dollars with which to pay barbers the rest of his life. I believe it is better to teach a man how to run efficiently his own business than to have a benevolent government give him soothing sirup that he may sleep and let some theoretically distinterested person run it for him.

The same economic laws govern conditions in petroleum refining that govern them in every other manufacturing industry. Any proposed Federal legislative refinery control program is, therefore, but part of a general control program for all manufacturing enterprise. All such proposals should be dealt with by the Congress, not independently, but as a part and parcel of the broad, national, industrial picture in considering the future life and extent of the National Industrial Recovery Act.

The present refinery program is not essentially Federal control. It is really largely Federal supervision of a permissive, co-operatively operated program of control, which, without the sanction of the National Industrial Recovery Act, would not be possible legally. The Federal Government says to the refiners of the United States that it will determine for them the proper amount of gasoline they should produce each month in order to balance consumption and supply; that, thereafter, they may divide this quantity among the several refinery districts and among the individual refiners in each. The method of allocation is left to the collective judgment and action of the refiners themselves. The Federal Government reserves the right to see that the allocations are fairly made. The general acceptance and observance by refiners of the individual quotas has been truly remarkable and the refining industry in its entirety has profited and will profit from the effort at self-restraint and self-regulation.

Many oil men have advocated and still advocate in one form or another Federal regulation or control of some phase of the oil business. Many, in doing so, perhaps have been thinking in terms of regulating or controlling the operations of competitors rather than their own operations. Many of you are chafing under various governmental restraints which originally you were instrumental in imposing. Now I do not have any direct responsibility to owners or stockholders for the success or failure of any refining company; therefore, it is perfectly clear that mine is not the final voice to determine what policy or program the refining industry or any particular company shall pursue. The only privilege I can exercise rightfully is to express my opinion which I do to this effect:

Conclusions

First, regardless whether you believe the present refinery control program to be sound or unsound economically, it is nevertheless the only program which the oil administrator and the refining industry have been able so far to develop; it is in effect as a part of your petroleum code and I believe it is good business for you to support and observe the program until you change it. If you want to change the program or the rules there is an orderly way to do it, but I would not disobey it so long as it is in effect with your approval. If the present program does not suit you or the interest you represent, I would say so out loud and exercise my legal and ethical right to advocate some other program as a substitute.

Second, I am not unmindful of the troubles, melancholies and miasmas peculiar to the times and to the competitive conditions under which refiners operate; nevertheless, I do not believe it is now or will ever be desirable or necessary from any point of view for the petroleum refining industry to surrender voluntarily and permanently to the Federal Government the control of its own business merely to get rid of troublesome competitors or to obtain relief from its own chiselers and its own passions. No one has yet, to my mind, given any satisfying assurance that a Federal Government controlled petroleum refining industry can or will serve the public interest in the future as satisfactorily or as cheaply as private control under the competitive system has served the public interest in the past.

Were it possible to give all men ability to comprehend the general welfare of the many rather than merely the personal gain of the few, we should go far and make rapid progress in solving the problems of this turbulent industry. It is my hope that through intelligent cooperative effort all of us may learn not merely old lessons, but how properly from time to time to apply them in solving new problems. No progress is ever made by fixing our eyes on the past and backing forward into the future. We advance by realizing that yesterday is only history while tomorrow is opportunity.

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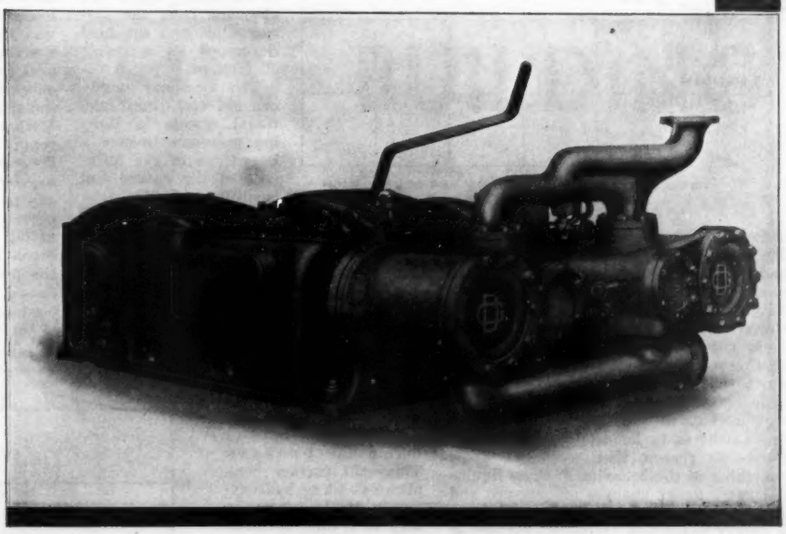

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Application of Thermodynamic Data to Petroleum Production Problems

By W. N. LACEY and B. H. SAGE
California Institute of Technology, Pasadena, Calif.*

Throughout the whole series of steps involved in the production and transportation of crude petroleum and natural gas, the conditions under which the hydrocarbon materials find themselves are almost continually changing. These changes of temperature, pressure, elevation or velocity may be gradual or abrupt; but in either case they result in corresponding changes in the properties of the complex mixtures of hydrocarbons. Since these processes involve changes in the volumes occupied, as well as changes in the pressures and temperatures prevailing, they must inevitably result in energy transfers as well. For these reasons the study of the fundamental principles of petroleum and natural gas production and transportation leads directly to that branch of physical science called thermodynamics, which deals with transformations of energy between its various forms.

The contents of petroleum pools are endowed with large amounts of energy due to the pressures and temperatures under which the fluids exist. This energy should be utilized, as far as is economically possible, in doing many useful tasks. However, even by ideal operations, we could not hope to get benefits from all of this energy store, and that portion which should be readily available is easy to lose and dissipate in forms which are economically useless. If this tremendous endowment is to be properly utilized, it stands to reason that we must know something of the behavior of these liquids and gases under changes of pressure and temperature — with particular reference to energy quantities. Only that portion of thermodynamics is needed which relates to the evaluation of energy transformations accompanying physical changes in systems consisting of liquids, gases, or both liquids and gases.

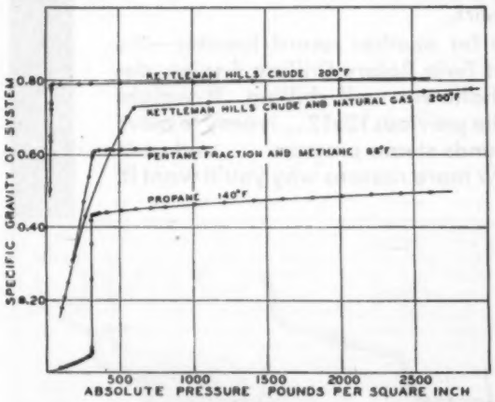

FIG. 1

Thermodynamic Values

The principal quantities with which one is concerned may be listed as follows, giving convenient symbols and units:

Pressure, p, lb. per sq. in. absolute.
Temperature, T, °F., absolute (called deg. Rankine).
Volume, V, cu. ft.
Heat content, H, B.t.u.
Entropy, S, B.t.u. per deg. Rankine.

The quantity called heat content is also known as 'total heat" and as "enthalpy." It is a very useful quantity, because changes in it indicate directly the amount of heat gained (or lost) by a system of constant mass during a change occurring at constant pressure, or the equivalent of the work done during a continuous flow adiabatic expansion. Furthermore, throttling processes without addition of heat—such as often occur at valves where the pressure drop is large—are characterized by the heat content of the system remaining constant.

The quantity called entropy serves to indicate how any given change in a system affects the ability of the system to do useful work. In a frictionless continuous flow process, the entropy change involved may be used to determine the amount of heat absorbed or given off. In adiabatic processes involving friction, entropy changes tell the amount of heat developed as the result of the friction. In a continuous flow process involving friction, the entropy change may be used — in conjunction with the heat content — to ascertain the heat absorbed from the surroundings and the heat developed as a result of friction.

The ordinary methods of treating frictional effects in flowing processes involve a knowledge of the influence of the nature and condition of the frictional surfaces, as well as specific information concerning the influence of conditions of flow and properties of the fluid upon the friction factors to be applied. When the fluid flowing consists of two phases (such as liquid and gas mixtures) the problem becomes exceedingly complicated. In such systems, not only will the relative quantities of the two phases change during flow, but also one phase may entirely disappear (or appear) during the process. This still further complicates the hydrodynamic treatment necessary to predict performance under these conditions. The use of the thermodynamic data permits the evaluation of these frictional effects without any knowledge of the mechanism of flow of such a mixture. One must have the variations of temperature and pressure along the "path," and must have available suitable thermodynamic data for the mixture in question. If the thermodynamic information has been obtained, the additional measurements to be made in the field, viz., temperature and pressure measurements, are comparatively simple to make, and the necessary calculations are not difficult.

Methods of Project 37

The methods in use by the Institute's Research Project 37 are briefly outlined below. The first step consists of the experimental determination of the relation of volume to pressure at constant temperature. The maximum pressure used is 3,000 pounds per square inch. Similar measurements are made at a series of temperatures covering the range from 60° F. to 220° F. As examples of the data obtained by this method, there are shown in Figure 1 four single isotherms for various hydrocarbon materials. The values obtained for the volume have been converted to specific gravity[1] to show more clearly the behavior of these substances. One curve is for Kettleman Hills crude oil (37.1 degrees A.P.I.). Its average molecular weight as determined by the lowering of the freezing point of benzene was 188. Another of the isotherms is for a mixture of this oil and a blended natural gas of the same composition as that obtained from the flowing well. The fractional analysis of the gas was as follows: Methane, 77 per cent; ethane, 11 per cent; propane, 6.7 per cent; n-butane, 2.4 per cent; iso-butane, 1.1 per cent; heavier, 1.8 per cent. The ratio of the gas to the oil was 110.3 cubic feet per barrel, both oil and gas being measured at 60° F. and 1 atmosphere. The sharp break in each of these curves represents the point at which the gas phase disappeared, leaving the system entirely liquid. The greater compressibility of the gas-saturated oil is shown by the relative slopes of the two isotherms in the condensed region. The specific gravity in the two-phase region is that of the system as a whole.

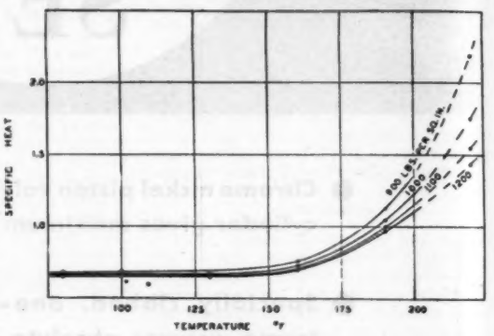

FIG. 2

An isotherm for a mixture of methane (methane, 99.29 per cent; ethane, 0.01 per cent; nitrogen, 0.7 per cent) and impure pentane (97.5 per cent pentane) is shown in Figure 1 also. The mixture was in the proportion of 133.1 cubic feet of the methane (measured at 60° F. and 14.73 pounds per square inch) to 1 bbl. of pentane (measured at 60° F. and its own vapor pressure). The more nearly linear relation of pressure to specific gravity in the case of this simple mixture in the two-phase region is quite apparent. An isotherm for propane has been included also. The constancy of the vapor pressure in the two-phase region is characteristic of the behavior of a pure substance.

It is of interest that, in each of the isotherms of Figure 1, some of the points were obtained by increasing the pressure, while others resulted after a lowering of the pressure. This furnishes a proof that equilibrium was being satisfactorily attained.

After the whole series of isotherms has been completed for a given material, the data can be used to calculate the changes in heat content and entropy which occur at each temperature as a result of changes in pressure. It is next necessary to determine the variations of heat content and entropy as functions of temperature. This is accomplished experimentally in one of three different ways.

In the case of a material which can be maintained completely liquid throughout the desired temperature range at pressures well within the maximum of 3,000 pounds per square inch, measurements are made of the changes in temperature of the liquid resulting from adiabatic changes in pressure. From these data can be calculated the specific heat at constant pressure. As a result of a series of such measurements the specific heat at constant pressure can be plotted as a function of temperature. To illustrate such results, Figure 2 presents a series of such curves for pure propane. Such data as these, when taken in conjunction with the results previously described, furnish sufficient information to determine heat-content and entropy as functions of both temperature and pressure.

In the case of a material which exists as two phases at some part of the temperature range studied, a different method must be used to determine the specific heat. The method resorted to in such a case is to measure the specific heat at constant volume by ascertaining the temperature rise of the material in a constant volume bomb upon addition of a known amount of heat, the process being carried out within an adiabatic calorimeter. The values obtained by this method can be used in a manner similar to that described in the preceding paragraph.

When the material concerned is gaseous throughout the temperature range, the determination of Joule-Thompson coefficients by measurements of the porous plug type offers a means of obtaining the required information to replace that obtained by the other methods described above. One of the three methods will be

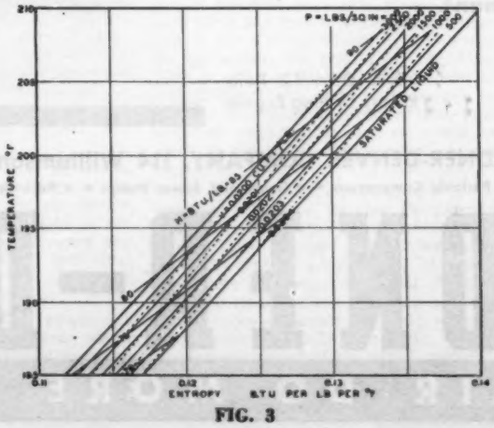

FIG. 3

*Before A.P.I., Dallas, Tex.

[1]Specific gravity, as here used, is the ratio of the weight of a unit volume of the material at the given temperature and pressure to the weight of a unit volume of water at its maximum density at atmospheric pressure.

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found suitable for any hydrocarbon material likely to be encountered in production practice, thus permitting the correlation of the five thermodynamic variables listed earlier.

This correlation furnishes tabulated data corresponding to "steam tables" for the case of water. As in the case of steam, graphical methods of presentation offer numerous advantages in the solution of many types of problems. Of the various possible charts showing the relations of the five quantities mentioned above, that using temperature as ordinate and entropy as abscissa appears to offer distinct advantages for application to problems of petroleum production. Upon such a chart, lines for constant values of pressure, volume, and heat content can be drawn—thus including the complete data upon the one chart.

As an example of such a temperature-entropy diagram, the thermodynamic properties of pure propane are shown in Figure 3. These data cover the temperature and pressure ranges normally encountered in production practice. Just to the left of the center of the figure will be seen the "saturation dome" with the critical point at its apex, the critical temperature being approximately 212° F. The left-hand limb of this curve corresponds to the case of propane liquid at its vapor pressure (saturated liquid). The right-hand limb, in turn, corresponds to saturated propane gas. The region beneath the dome applies to equilibrium mixtures consisting of both liquid and gas phases. That portion of the diagram to the left of the dome describes the behavior of liquid propane at pressures greater than its vapor pressure. The area to the right of the dome presents information concerning the properties of superheated propane gas.

Absolute entropy values are not obtainable from the measurements upon which this diagram was based. However, since changes in entropy are the only values required, this causes no inconvenience. As in the case of steam tables, one may choose an arbitrary datum, and give entropy values with reference to such datum. As will be noted in the figure, the entropy of saturated propane liquid has been arbitrarily set equal to zero at 60° F.

The nearly vertical solid lines which are labeled near the top of the figure are lines of constant pressure. Within the saturation dome, these lines become horizontal; since a pure substance, such as propane, condenses or vaporizes at constant temperature and pressure.

The short-dash lines of the figure are lines of constant specific volume (cubic feet per pound). When both liquid and gas phases are present (within the dome) these lines indicate the specific volume of the whole mixture. The long-dash lines within the dome—meeting at the critical point—are lines of constant quality, or of constant mass fraction of the mixture which is in the gaseous state under the conditions prevailing.

The solid lines, which for the most part slope downward to the right, are lines of constant heat content or total heat. This quantity, for the same reasons as in the case of entropy, has been set equal to zero for the saturated liquid at 60° F. If one is interested in values which do not fall upon a line shown, interpolation between lines given will indicate the position of the line desired. This same treatment may be used for any of the five variables shown upon the diagram.

Use of Diagram

To illustrate the use of the diagram, let us assume that a sample of propane is at a temperature of 180° F. and occupies a volume per pound of 0.10 cubic feet. By locating the position on the diagram where these two conditions are met, it is found that the propane exists as a mixture of 0.56 pound of liquid and 0.44 pound of gas per pound of mixture, the pressure being approximately 470 pounds per square inch, absolute—the heat content being about 123 B.t.u. per pound, and the entropy is 0.204 B.t.u. per pound per degree Fahrenheit, absolute.

As another example of information obtainable from the diagram, assume the above sample of propane passes through a continuous flow process which leaves the sample at 80° F. and an absolute pressure of 50 pounds per square inch. Under these final conditions the sample is found to exist entirely as a gas, with a specific volume of 2.55 cubic feet per pound, a heat content of 164 B.t.u. per pound and an entropy of 0.347 B.t.u. per pound per degree Fahrenheit, absolute.

To indicate further use of this information, assume arbitrarily that the above-mentioned process consists of the flow of propane through a continuous vertical pipe, 4,000 feet long, and that both the decrease in pressure and the heat gained or lost through the walls of the pipe are directly proportional to the distance traveled in the pipe. In this case, the useful work of lifting amounts to 4,000 foot-pound per pound of propane, which is equivalent to 5.1 B.t.u. per pound. In such a flowing system, the difference between final and initial heat contents gives the net increase or decrease of energy in the flowing fluid. In the assumed case this increase is 164 — 123 = 41 B.t.u. per pound. This net increase in energy, in spite of the fact that useful work has been done, indicates that energy in the form of heat has been added to the fluid through the walls of the pipe. The amount of heat absorbed must then be 41 + 5.1 = 46.1 B.t.u. per pound.

On the basis of the assumed conditions relating to the change in pressure and the heat gain through the walls, it is possible to follow the path of the changes occurring during the process. As a result of this, one may read from the diagram corresponding values of temperature and entropy for any stage of the process. By reading a series of such values and replotting them with entropy as abscissa and absolute temperature as ordinate, one may determine the area below the resulting curve between the initial and final conditions, and thus obtain the value of the sum of the heat absorbed through the walls and the heat developed as the result of friction. The friction results both from turbulence within the fluid and from movement of fluid relative to the interior pipe wall. For the case assumed, this sum was found to be 81.4 B.t.u. per pound. Since the heat absorbed was found above to equal 46.1 B.t.u. per pound, the heat developed as a result of friction is found to be 81.4 — 46.1 = 35.3 B.t.u. per pound. This quantity of heat has been produced at the expense of energy otherwise available for doing useful work. Another way in which energy has been utilized during the process was in increasing the velocity of the flowing fluid. The energy required for this purpose is usually small, and in the assumed case would be approximately 0.2 B.t.u. per pound if the final velocity were assumed to be 100 feet per second. It should be remembered that this particular process was arbitrarily chosen for purposes of illustration, and the resulting values have no relation to any actual system.

In the case of most mixtures of natural gas and crude oil, only a limited region of such a chart is of interest in connection with production problems. In many cases this region would consist of the lower left-hand portion of the complete diagram. A chart for the special case of a crude oil obtained from an atmospheric-pressure vent tank is shown in Figure 4. This chart shows the behavior of a Kettleman Hills crude (37.1 degrees A.P.I.) when subjected to pressures greater than its vapor pressure. This diagram is shown on a much larger scale than was used in Figure 3 and, consequently, corresponds to only a very small portion of a complete diagram.

The information presented by tabulations or diagrams involving the five chosen variables may be utilized to calculate other useful thermodynamic quantities. For example, one may obtain values of intrinsic energy, of specific heats, or of throttling coefficients in any portion of the temperature or pressure ranges investigated.

Some Applications

Although it would be impossible to discuss herein the detailed application of thermodynamic data to specific production problems, it may be of interest to indicate briefly some of the uses to which such information may be put. It must be realized that there are restrictions and difficulties in the use of these methods. They apply rigorously only to cases where the materials are of constant composition throughout the process and which are at equilibrium at all times. Furthermore, it is difficult to obtain the neces-

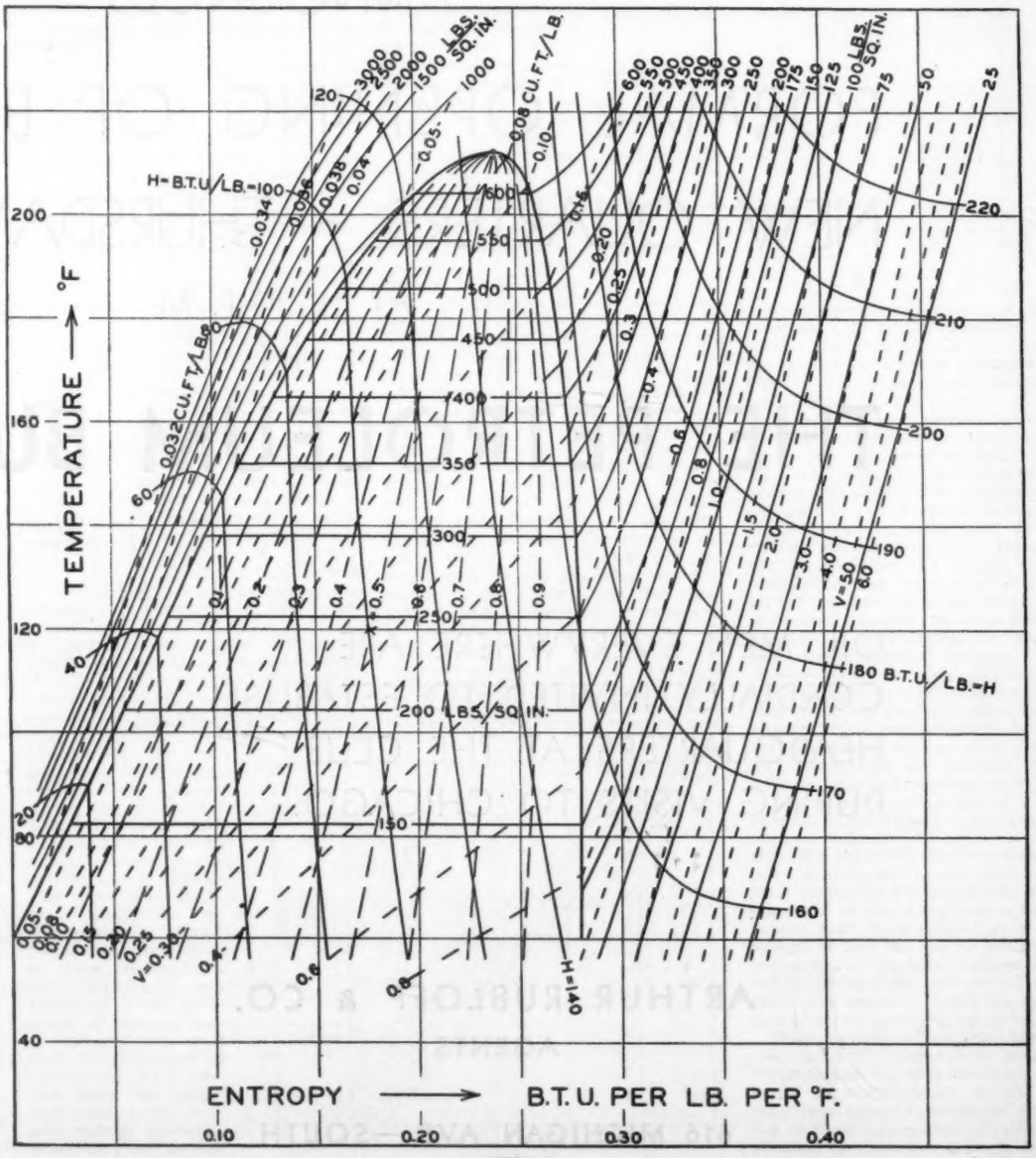
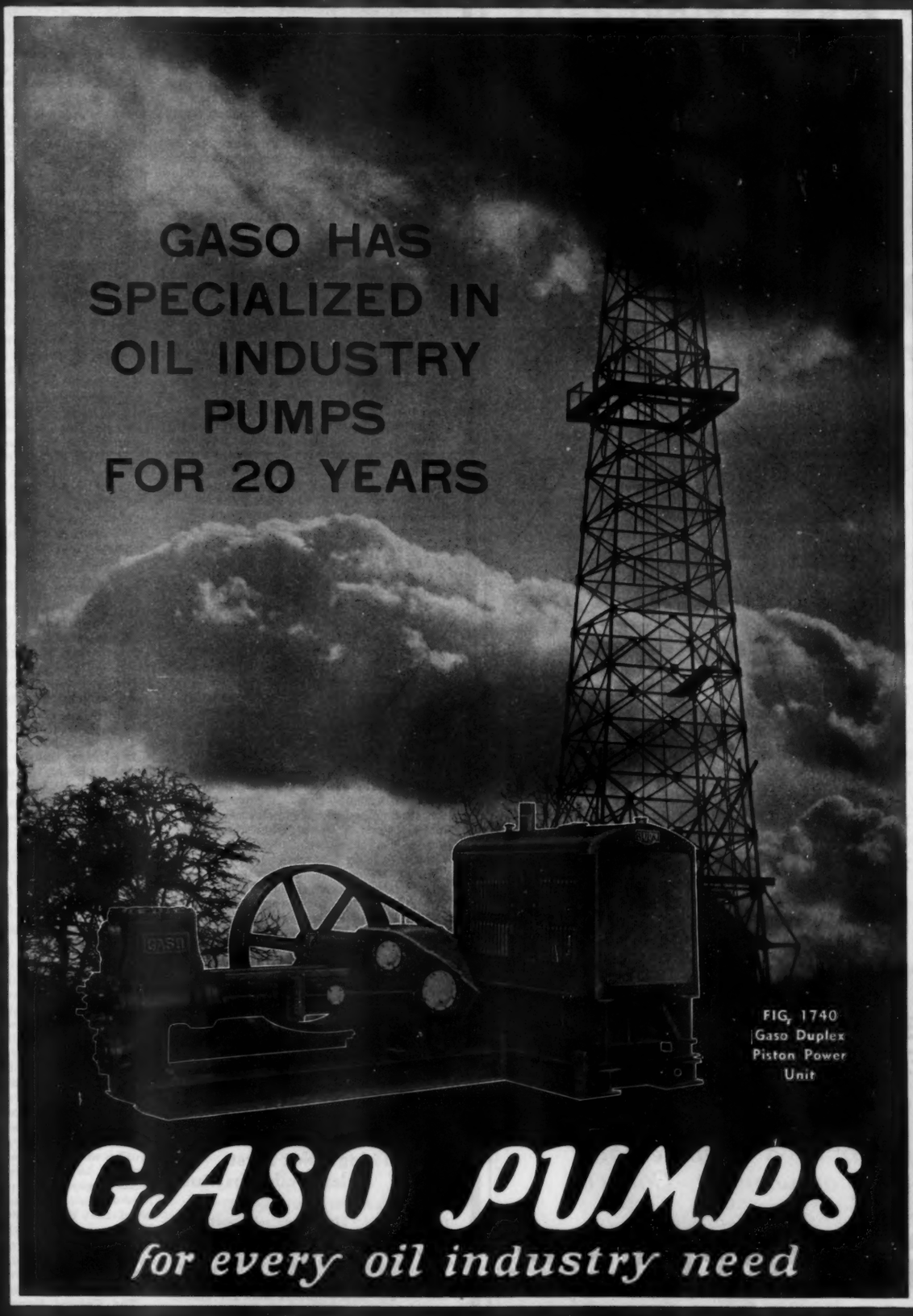


FIG. 4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sary pressure and temperature data under field conditions. Perhaps the most serious disadvantage to the present use of these methods is the scarcity of the required thermodynamic information.

As indicated earlier, one of the principal uses for these methods lies in their application of flow processes. One of the first of such processes encountered in petroleum productions concerns the flow of fluids through the oil sands to the bottom of the well. If original formation pressures and temperatures are known, and it is assumed that such conditions still exist in the regions from which oil flow starts, one can determine the variations of the available energy dissipated as the result of friction during flow to the bottom of the well as a function of the rate of production from the well. The additional field data required would result from depth temperature and pressure measurements at varying production rates, as well as corresponding gas-oil ratios.

Similar field measurements made at varying depths within the flow string of a flowing well furnish the required information to determine the efficiency of energy utilization during the flowing process as a function of the rate of production. Corresponding results may be obtained for wells operating upon gas lift. If suitable temperature and pressure measurements can be made in a pumping well, similar information may be gained. A number of similar problems occur in oil or gas transportation lines, and offer opportunity for treatment by the same methods. In all of these cases the effect of variations in mechanical features of the equipment used may be followed by systematic measurements.

Throttling occurs in production processes, and its effects upon the condition of the materials flowing can be predicted. Examples of throttling include the use of beans in flow strings and of pressure-control valves in pipe lines. The methods here discussed are equally applicable to materials existing in either one or two phases.

At certain stages in the production and processing of petroleum and natural gas, energy must be added to the material handled. This may be accomplished by the addition of heat or by the accomplishment of work upon the materials. Examples of the former process are found in the natural gasoline plant, while the latter process is found in pumping and compressing operations. A knowledge of the thermodynamic properties of the materials involved would allow the prediction of the energy requirements to accomplish the desired operations.

In all of the cases discussed above the physical changes occurring are of importance, as well as the energy transformations. The thermodynamic data permit the prediction of changes in the physical state of the material, and give definite knowledge of the volume of the system for given temperature and pressure conditions. Such information is desirable in connection with the estimation of reserves in underground oil pools, and assists in the proration of production based upon permission for an operator to produce reservoir materials to an extent which corresponds to depletion of the reserves of the field by a given volume as measured underground or by a given amount of reservoir energy.

First Things Not First, Byles Tells Institute

(Continued from Page 81)

fact proved by history, namely, that need and price will either produce the required quantity of any product or will produce a substitute for it. The needs of the future impel us not to waste this resource. The above observations are made, however, lest overemphasis unnecessarily burden the present generation.

Destructive Legislation

Reflection, during the past six months, on the experiences of the past 18 months, would constrain me, if a member of the Seventy-fourth Congress, to vote against such legislation as the Thomas-Disney bill. My reason for this is as follows:

Even assuming that such legislation would stand the constitutional tests to which it would be subjected and that the Federal Government could successfully police all wells, pools, and operations where violation of its orders were attempted, it would then be in absolute and exclusive control of the crude oil supply. Having attained this position, it would be compelled to allocate its allowable supply among the hundreds of refineries now in existence and those which would rapidly be built. This would mean practical control by the Federal Government of refining operations, which in turn would necessitate control of marketing operations, including the fixing of prices for crude and products. This would mean the end of private management—the socialization of the industry. Such a condition, if it came about, would result in the most inefficient and high-cost operation possible to conceive. Complete control of crude oil production by the Federal Government would, in my opinion, be the end of the oil industry as a private business, and the result would be as indicated.

This statement may come as a shock to some of you. It will not be agreed with by the proponents of such legislation. They would not be proponents if they shared this view. They no more want such an eventuality than I do. The public does not want it, the industry does not want it, the Government does not want it. If it comes, this country will in time get rid of it, but it will walk through a shambles to do so. We have difficulties at present, and some of them are grievous indeed; but a solution can be found along other lines, and it is the responsibility of the industry to find and apply it.

Federal and State Powers

In this connection I recommend to you and to the congressional committee a careful study of Mr. Ely's book, "Oil Conservation Through Interstate Agreement." Therein the facts are clearly stated and the respective powers of the state and Federal governments defined. Until we have read and reflected upon this book, we ill serve our cause and fail in our public duty should we lightly dismiss the subject. State control of flush pools is by means of proration which, notwithstanding occasional inequitable applications and failures of enforcement, has in a number of states the sanction of law and the benefit of practical experience. It, and it alone, has stood between us and a veritable flood of production. Interstate compacts would further, and would give opportunity to perfect this method of control.

Law-of-Capture Difficulty

If the states and the industry are in earnest about conservation and desire ot lower costs, they might turn their attention to the source of our crude oil difficulties, namely, the law of capture. In as much as it has become a law of property, amendments of state constitutions would probably be required. Were this accomplished, unit operation of pools would become possible, and would logically and inevitably follow. I use the word "inevitably" because such operations yield the maximum amount of crude oil at the minimum cost, increasing the profits of the industry and decreasing the cost to the public—thus serving the common good. This procedure may seem burdensome; but I venture to express the belief that if half the energy which has been spent during the past 18 months under the Federal code were expended in a campaign of education along these lines, real progress would be made toward a final solution of the problem.

The Federal Government can aid by continuing to prohibit interstate shipments arising out of violations of state laws. It can assist the states, whether or not they are parties to a compact, by making and furnishing studies showing the overall demand for crude oil and its products—and this can, and should, be done in collaboration with the industry

itself. It can further assist by encouraging the industry to correct bad practices and eliminate maladjustments by proper and open agreements for the correction of such abuses.

There are duties and opportunities for service by each the state and Federal governments and preponderately by the industry itself. None has a monopoly of wisdom or patriotism. The wisdom, experience, and co-operation of all are needed.

Product Prices Versus Crude Prices

The history of the business indicates that it does not enjoy sustained or general prosperity with low crude oil prices. It also indicates that product prices in the long run will always control the price of crude oil. During the period of the code, product prices have not justified crude oil prices—which have been maintained in the hope of elimination of illegal production, the observance of crude allowables and gasoline quotas, and the correction of certain bad marketing practices would stabilize the situation. During recent months conditions have become progressively worse. Refiners, dependent in whole or in large part upon purchases of crude oil at the posted prices, have suffered appalling losses. Purchases of uncontrolled production of distress gasoline, in an endeavor to stabilize markets pending the drying up of illegal production of crude oil and gasoline manufactured therefrom, aggravated rather than relieved the situation.

It would appear that, notwithstanding the best intentions on the part of the administration and code authorities—in which the majority of the industry has co-operated, regardless of the sacrifices entailed—an error has been made in ignoring the remedial influence of free crude prices. Tying down the safety valve merely defers an explosion which venting of pressure would avoid. A 10-per cent cut in the price of crude applied in time is more effective than a 50-cent cut applied too late—and costs considerably less. There is nothing sacrosanct about crude prices. They should be flexible, moving up and down in response to existent conditions; and changes, if promptly made, need not be great. The industry should not allow situations to develop which require the movement, either up or down, of crude oil prices more than 10 cents at one time. When we have been punished sufficiently by artificialities, our respect for most stabilizing influences in industry, namely, the effect of free prices, will return.

If you were to ask why an artificial price is harmful, I would reply: (1) It stimulates supply and impairs statistical strength. (2) It creates inequities by causing one branch of our business to subsidize another. (3) It brings in political complications, and ultimately becomes a racket. We need to rescue and defend our price structure from these grave dangers.

Recovery With Cessation of Illegal Production

The statistical situation of the industry has materially improved during the year, due principally to a substantial increase in consumption and the failure to discover new pools of great magnitude in spite of the incentive of higher crude prices. Orderly development of new pools has been helpful, and is essential. Such development would no doubt be advanced by interstate compacts, and would inevitably follow abolishment of the law of capture. In view of this rather favorable statistical situation, recovery need not long be delayed if illegal production can be stopped. If it cannot, then producers who are being robbed should be freed to protect themselves.

Private Ownership and Public Interest

I would like to sum up my thoughts on the general situation by returning to the one first expressed, namely, that the public interest in this, as in any other industry, is paramount; that the public interest is best served by private ownership, management, and operation of this complex and far-flung business; that, in the long run, in this, as in every other business operated under the private or competitive system, the individual or group of individuals who can furnish to the public the best products at the lowest cost will longest survive and derive the greatest profits; that the alternative is a government control which would inevitably lead to state socialization—which manifestly would not be in the public interest.

Necessity of Sound Business Planning

On a previous occasion I paid tribute to rugged individualism. I fear that some may have confused this term with ruthless individualism. The ruthless individual is an enemy of society, and should be dealt with accordingly. There never was a time, however, in my opinion, the qualities of the rugged individual were more needed than today. Co-operation between industry and Government is indispensable to recovery. A more intelligent and higher degree of co-operation can be obtained among people who do their own thinking and their own planning than can ever be attained under an economy planned by the state. Governmental planning is as essential to good government as economic planning is essential to sound and successful business. There is work enough in each field for those charged with these respective responsibilities, and there remains the additional responsibility on the part of each to harmonize their efforts for the common good.

There is a way of life which is founded in ethics and lighted by the torch of idealism, but in following this way we cannot ignore practical economies. There need be no conflict or lack of harmony between them. Each fails of any worthy accomplishment without the aid of the other.

The petroleum industry has never faced graver responsibilities than those of today. My knowledge of the courage, resoucefulness, and ingenuity of the rank and file, as well as of the executives in this buriness, is such that I expect them to find the way. A sympathetic understanding and some assistance from the Government—state and Federal—is needed, and we have confidence that it will be given.

Profits Earned, Not Given

In times of distress, an understandable weakness of human nature is to seek some means of bringing about the millennium over night. It cannot be done. The longer we follow false economic gods and the further we stray from the proven paths of sound business procedure, the greater will be the suffering and the longer deferred will be the recovery. From the experience of the past few years, we should have learned that it is as true now as it was when said ages ago: "In the sweat of thy face shalt thou eat bread." Profits cannot be given. They must be earned.

CANADIAN GAS PRODUCTION

OTTAWA, Canada, Nov. 10.—Official figures show that natural gas production from all Canadian fields in August totaled 898,456,000 feet compared with 951,466,000 feet in July and 941,743,000 feet in August, 1933. In the eight months of 1934, the Canadian output totaled 14,870,388,000 feet which was 2.4 per cent below the 15,228,583,000 feet produced in the corresponding period of 1933.

Imports of mixed (natural and artificial) gas into Canada in August totaled 9,677,000 feet worth $6,331 against 7,330,000 feet worth $4,955 in July.

HEAVY CRUDE SHIPMENTS

COUTTS, Alberta, Nov. 10. — Crude oil shipments over the Canadian Pacific Railroad from Coutts have been unusually heavy, a number of extra trains being run to handle the traffic.

PETROLIA REFINERY EXPANSION

PETROLIA, Ontario, Nov. 10.—Excavation work is in progress at the plant of Canadian Oil Companies, Ltd., preliminary to the erection of a $350,000 addition to the local refinery.

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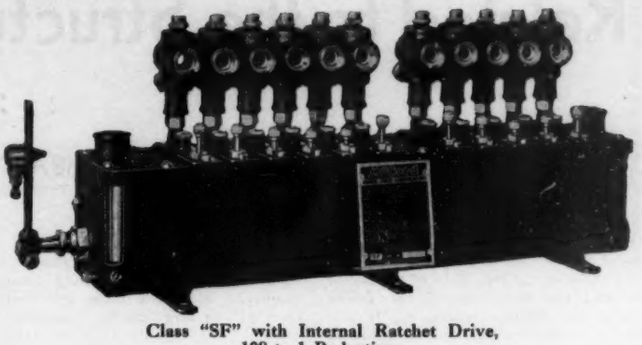

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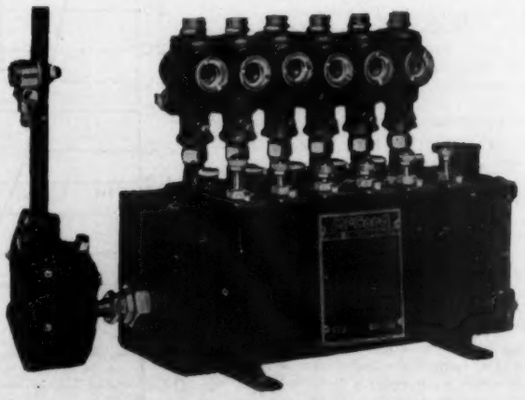

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The Mechanism of Oil Viscosity as Related to the Structure of Liquids

By W. K. LEWIS and LOMBARD SQUIRES
Massachusetts Institute of Technology*

An adequate appreciation of the properties of liquids can be based only upon a clear picture of the structure of the liquid state and the character of the forces which operate in maintaining it. It will certainly be agreed that most technical men are hazy in their concept in this field and the first purpose of this article is, not to present a new analysis or new ideas but to attempt to develop clarity in the qualitative understanding of the situation. It is hoped that this clearer insight will lead to an explanation of the general relationships of the properties of liquids, particularly of the one in which we are mainly interested, namely, viscosity.

The kinetic theory of gases gives a satisfying and convincing explanation of the properties of the gaseous state. It visualizes rapidly moving molecules (particles) traveling in random directions and at variable speeds, whose average kinetic energy of translation depends only on the temperature and is independent of the size or structure of the particle. The pressure exerted by the gas, i.e., its tendency to expand, is caused by the bombardment of these particles against the walls of the containing vessel, and is therefore proportional to the concentration of the particles and inversely proportional to the volume occupied by any given quantity of the gas. In a liquid the molecules are obviously closely packed together. Furthermore, the kinetic theory indicates that their effective average kinetic energy of translation is identical with that of a gas at the same temperature.[1] Hence it is necessary to explain the fact that the molecules, despite their close packing and high kinetic energy, do not exert a high pressure upon their surroundings. The explanation universally accepted is that molecules attract each other, because of forces which become very large in magnitude when the molecules are close together, but decrease rapidly to a completely negligible value when they are far apart. To understand the behavior of liquids it is imperative to have the clearest possible picture of the character of these attractive forces between the molecules.

Intermolecular Attractions

There is no doubt that both molecule and atom are electrical in structure, but while electrically neutral as a whole, the charges of opposite sign which exist within them are not coincident in position, so that in consequence there exist around the molecules stray fields of electric force. The nature of these fields of force, so far as influence upon the structure of the liquid state is concerned, is probably best visualized by analogy to magnetic fields. Thus, a short bar magnet, while surrounded in its immediate neighborhood by a strong, effective magnetic field, will exert no appreciable magnetic effect at a distance from itself great in comparison to the distance between its poles. If, now, beside this first magnet be placed a second, equal in length and magnetic strength, but with poles reversed, the pair will in large degree neutralize each other. Thus, the distance at which the magnetic effect of the combination becomes negligible is far smaller than the corresponding distance for the first magnet. None the less, around the pair there still exists a residual stray field of magnetic force capable of exerting considerable magnetic attractions and repulsions upon magnetic bodies coming within its range of action. There is every reason to believe that around the molecules exist analagous stray fields of electric force, that are appreciable no matter how complete the internal neutralization of the structure, as for example in the case of the noble gases.

This concept of the fields of force around the molecule leads to three conclusions which offer explanations of facts otherwise difficult to understand. In the first place, the range of action of the forces is extraordinarily small, but their magnitude may be enormous within that range. In the second place, the forces are clearly effective only on the surface of the molecule or in its immediate neighborhood, and in this sense the total force per molecule should be proportional, other things equal, to the surface of the molecule and hence in general increase with the molecular weight. In the third place, there is every reason to anticipate wide variation in the intensity of the forces with variation in the structure of the molecule, depending on the character of the elements involved and the nature of their arrangement in the molecule.

The molecules of a fluid are subject to the action of two sets of forces, one group tending to separate them and expand the fluid, the other to draw the molecules together and compress it. The actual state of the fluid is determined by the balance of these disgregating and aggregating forces. In the case of a gas, the major disgregating force is the repulsive effect of the molecules caused by their kinetic impacts with each other; the major aggregating force is the externally applied pressure, usually exerted by the walls of the containing vessel.[2] In the case of a liquid, the disgregating tendency is probably still due largely to thermal molecular impacts, but, owing to the propinquity of the molecules, their mutual attractions have become the predominating aggregating force to a degree almost completely overshadowing the effect of the externally applied pressure.

The effect of the mutual molecular attractions is substantially equivalent to a hypothetical externally applied pressure, as can be seen in Figure 1. The line AB represents the interface between a liquid and its vapor. C is a molecule in that interface, the circle around which represents its sphere of action, i.e., the zone within which its attraction for other molecules is appreciable. In the liquid half of this sphere of action lie a large number of molecules, each of which is attracting C with a force, whose sidewise component is neutralized by the effect of a corresponding molecule on the other side of a plane through C perpendicular to AB, but the inwardly directed component of which is cumulative, the total effect being represented by the arrow CD. Because of the small number of molecules in the vapor side of the sphere of action, the corresponding outwardly directed force may be neglected. Since every molecule in the surface layer AB is attracted inwardly in this fashion, it is clear that the resulting effect is equivalent to an inwardly directed pressure upon the surface of the liquid. This pressure is the so-called interior pressure of liquid. While no exact method of measuring it has ever been developed, its value can be approximated in various ways. For ordinary organic liquids, it usually amounts to from 500 to 3,000 atmospheres, but for some liquids, e.g., water, it may be as high as 12,000 to 15,000 atmospheres. It will be noted that these pressures are enormous in comparison with the ordinary vapor pressures of liquids. As the critical condition is approached, the two become more nearly equal. In any event the state of the liquid is determined by the balance between the sum of the internal and external pressures on the one hand and the expansive effect of the intermolecular kinetic impacts on the other.

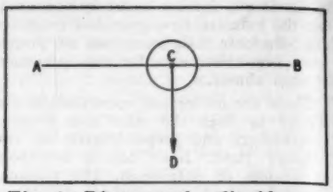

Fig. 1—Diagram of a liquid-gaseous interface showing the sphere of action of a molecule at C and the resultant of all liquid molecular forces in the sphere acting on the molecule

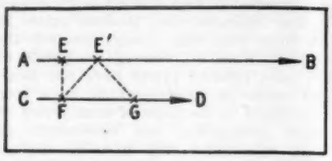

Fig. 2—Diagram of the mechanics of the intermolecular attraction in streamline liquid flow

The disgregating effect of the kinetic impacts is determined by the average kinetic energy of the molecules, and this in turn is, approximately at least, independent of molecular weight, structure and propinquity, and proportional to the absolute temperature. Consequently, so far as the disgregating effect is concerned, changes in temperature should produce the same result for all liquids at all temperature levels. However, the characteristics of the aggregating force of internal molecular attractions are entirely different. The magnitude of the force increases greatly with the molecular weight, i.e., with the size of the molecule and its surface, and also with molecular propinquity, or, what is equivalent to the same thing, liquid density.

Mechanism of Vaporization

It is obvious that the tendency of the molecule to escape from the liquid into the vapor will increase with the temperature, because of the increase in its average kinetic energy of translation. It is equally obvious that its net tendency to escape (i.e., its vapor pressure) will be the less the greater the attraction of the liquid for it. This backward attraction toward the liquid surface will increase with the molecular weight and the density of the liquid, and with the intensity of the surface forces. Furthermore, because of the rapid increase of the attractive forces as the distance between the molecules decreases, the effect of changing liquid density will greatly

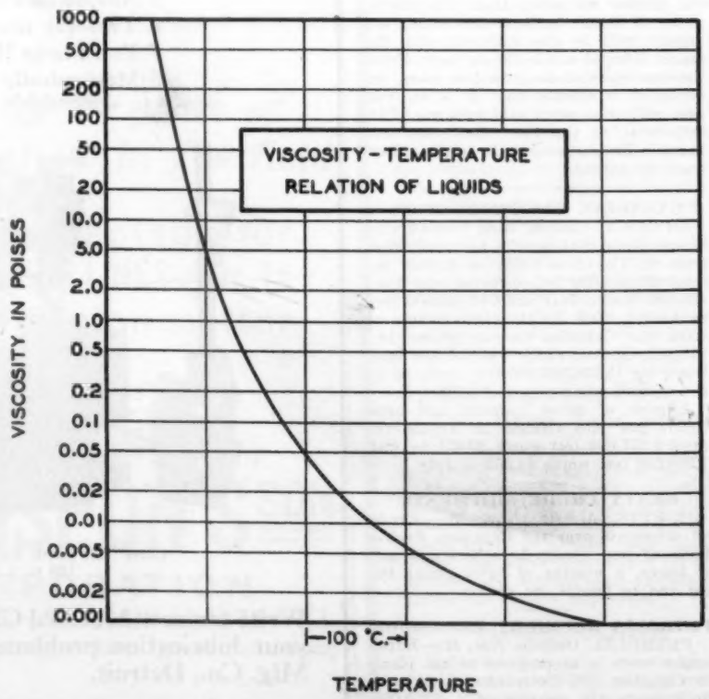

Fig. 3

[1] This conclusion is confirmed by the fact that, at least in dilute solutions, osmotic pressure follows the gas laws. Each molecule of the solute can be looked upon as a tell-tale, indicating the average kinetic energy of translation of all molecules in the liquid, including those of solvent.

[2] In the case of the atmosphere the aggregating effect is the force of gravity.

*Presented before annual meeting of A.P.I. in Dallas.

Authors' title: "The Structure of Liquids and the Mechanism of Viscosity."

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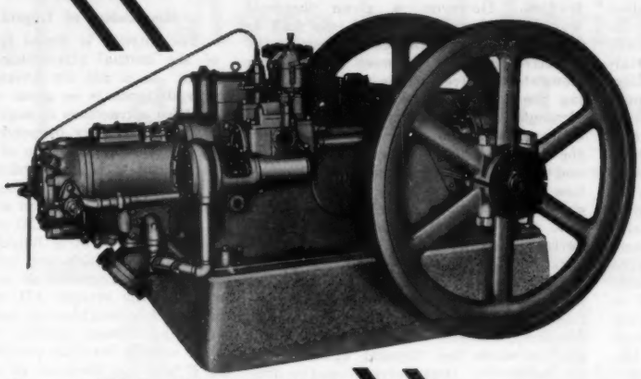

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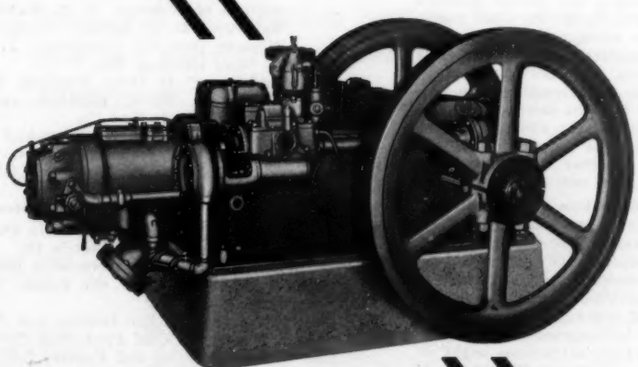

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outweigh the effect of changes in molecular weight. Furthermore, the evidence indicates that the same is true with respect to the change in intensity of the surface forces, i.e., of the so-called polarity of the molecule.

The results of these varying effects is well illustrated in the influence of temperature on the vapor pressure of a liquid. An increase in temperature produces a relatively small increase in kinetic energy of the molecules, with a correspondingly small increase in gross escaping tendency. If the character of the liquid itself remained unchanged, the increase in vapor pressure would be slight. However, because of the increase in kinetic energy of the molecules in the liquid, their tendency to separate increases, and the separation itself decreases the mutual molecular attractions in the liquid out of all proportion to the increase in the separating tendency as such, so that there is a great decrease in the net molecular attractions. In consequence, because of the relatively minor increase in gross tendency of the surface molecule to escape from the liquid, together with the major decrease in the forces pulling it back into the liquid caused by the drop in liquid density, the net increase in escaping tendency, i.e., in vapor pressure, is greatly out of all proportion to the rise in temperature which caused the change. In other words, the vapor pressure curve changes extremely rapidly with temperature—a property universal in all normal liquids.

Surface Molecule C

Referring back to the preceding diagram, visualize what is happening to the surface molecule, C. It is bumping around at a high but variable velocity, colliding with the molecules in its neighborhood and rebounding from them. At some instant it will undergo a collision such that its rebound gives it a component of velocity perpendicular to the surface of the liquid, out towards the vapor space. If its velocity in this direction is small, it will soon be stopped by its attraction backward toward the liquid surface, and, like a ball thrown into the air, it will fall back again into the liquid. The greater its component of velocity outward, the higher it will rise from the liquid surface before returning. If its outward component of velocity is sufficient, it will rise above the liquid a distance greater than its sphere of action, and in this event it will lose all tendency to return to the liquid. In other words, this particular molecule will have evaporated, i.e., transferred itself permanently from the liquid into the vapor state. Clearly, in this transformation, the molecule absorbed from its neighboring molecules in the liquid the energy requisite for overcoming the attractions of the liquid for it—in other words, furnished its energy, i.e., its heat of vaporization.

A second illustration is the influence of molecular weight on boiling point. Consider, for example, the straight chain paraffin hydrocarbons. From our knowledge of their chemical structure, there is no reason to anticipate marked variation of intensity of the surface forces from one of these hydrocarbons to another. Therefore, the total attractions ought to be roughly proportional to the total surface, which, however, in this group of substances would be approximately proportional to the molecular weight. Consequently, the attractive forces should increase with molecular weight, whereas the disgregating tendencies, due to kinetic energy, should be independent of it. Consequently, it should be more difficult to separate from the liquid the molecules of a compound of high molecular weight than those of one lower in the series. Since the only way to increase the disgregating tendency is to increase the temperature, it should require higher temperature to transform high-molecular weight liquids into vapor—in other words, boiling point should increase with molecular weight, as is of course well known to be the case. Indeed, no compounds of really high molecular weight are low boiling.

The outstanding differences between the viscosity characteristics of gases and liquids are three: the viscosity of a gas is always small, whereas that of the liquid is relatively high; changes in density of the gas have practically no effect on its viscosity, whereas the influence of the density of the liquid on its viscosity is very great; finally, the viscosity of a gas increases with temperature, whereas that of the liquid decreases. Why these characteristics, and particularly why these differences between the two types of fluids?

Visualize a gas flowing in streamline motion. Each element or lamina of the gas is moving in a smooth, streamline curve, slipping past a neighboring parallel element moving at a lower velocity. The molecules in both elements are moving in the disordered motion of thermal translation, but superimposed upon this is the directed motion of fluid flow. However, the latter is larger in the rapidly moving element than in the neighboring slower moving one. Owing to the thermal agitation, molecules are continually passing from one element to the other. As a molecule moves from the zone of high velocity into that of low, it collides with the molecules of the latter, and is obviously slowed down. While a part of its former directed energy is imparted to increasing that of the molecules of the slower moving element, a part is dissipated as undirected energy, not only of molecular translation but also usually of one form or another of molecular vibration. Similarly, slow moving molecules wandering into the high velocity stream slow down the latter and, while themselves speeded up, there results a net dissipation of directed into undirected energy, i.e., a conversion of work into heat. This loss of directed energy is the friction of viscous flow.

Visualize doubling the density of the gas in such a case of streamline flow. Clearly, this results in doubling the number of molecular collisions, tending to increase energy degradation due to viscous friction. However, a given molecule would on the average travel only half as far between impacts. Consequently, the effective distance between neighboring elements is halved. This results in halving the velocity differences between the elements and consequently halving the energy dissipation per impact. Clearly the effects tend to cancel qualitatively, and analysis of the mechanism of energy loss on the basis of the kinetic theory shows that the cancellation is quantitative. This means that the energy degradation is unaffected by changes in gas density, i.e., the viscosity of the gas is independent of the density and hence of the absolute pressure, so long as deviations from the gas laws are negligible. Similarly, increase in temperature of the gas increases the thermal agitation of the molecules, thus increasing the frequency of collision and of transference of molecules from one element to another, resulting in increased energy dissipation, i.e., in increased viscosity of the gas.

If now one considers streamline flow in a liquid, it is clear that every factor just discussed with regard to the viscosity behavior of a gas is equally applicable in the case of the liquid. Why, then, does increasing density so enormously increase the viscosity of the liquid, whereas it has no effect on that of the gas, why is the viscosity of the liquid so much higher than that of the gas, and why is the effect of temperature exactly the opposite?

Mechanism of Liquid Viscosity

The answer is found in the influence of the mutual attractions of the molecules. In a gas the average intermolecular distance is so great that the effect of these attractions is negligible, whereas in the liquid they preponderate. Because of the thermal agitation of the molecules in a fluid it is extraordinarily difficult to picture the condition diagrammatically, but an attempt has been made in Figure 2. Consider AB and CD as parallel elements of flow in a liquid, the relative velocities of which are indicated by the length of the arrows. E is a single molecule in the stream AB, and F and G are the two neighboring molecules in the adjoining element of flow. Now visualize E as moving into the position E′ relative to F and G. Because of the proximity of the molecules, there is a large attractive force between E and F, and clearly energy must be expended in separating these two molecules against this attraction as E moves into the position E′. Furthermore, this expenditure is directed energy, i.e., work. However, as soon as the position E′ is passed, the net attraction of E′ is toward G rather than toward F, so that further forward movement from the position E′ involves recovery of an amount of energy exactly equal to that just expended. However, E′, instead of continuing to move in the direction AB, will be drawn toward G by a large and progressively increasing force, will collide with it, and rebound from it. Furthermore, the rebound is sure to be in some degree randomly directed, so that the corresponding energy recovered due to the attraction of E′ by G will be randomly directed, i.e., will be in the form of heat. In other words, the work of separation of E and F due to the flow will involve conversion of directed into undirected energy, i.e., degradation of work into heat. The magnitude of this loss will depend on the magnitude of the mutual attractions: in the case of the gas the intermolecular distances will be so great that this particular loss will be negligible;* in a liquid it will be great, and obviously it will be greater the closer the molecules, i.e., the greater the density of the liquid.

The underlying reasons for the differences in the viscosity characteristics of gases and liquids now become clear. The viscosity of the liquid is far greater than that of the gas because in the latter the energy degenerated by molecular attractions is negligible while in the former it is preponderant. The viscosity of the liquid decreases with temperature because expansion greatly reduces the intermolecular attractions and hence the friction losses they induce. Increase in liquid density at constant temperature brings the molecules closer together, results in large increments in the attractive forces and corresponding increases in viscosity. Rise in temperature at constant volume leaves the total attractive forces substantially unchanged but decreases their net effect because of the increase of the repulsive tendencies due to the translational velocities of the molecules. Even more striking is the insight given into the temperature coefficient of viscosity. The kinetic theory indicates that the effective translational kinetic energy of the molecule is proportional to the absolute temperature, the constant of proportionality independent of molecular size and structure. However, the actual degree of separation of the molecules is determined

*In the gas the molecules attract just before and after collision, but not to a significant degree in their mean positions, and hence not at the time that directed energy is being imparted to them.

Petroleum Electric Power Club Program, Sixth Annual Conference, Beaumont

The Petroleum Electric Power Club, an organization that is the outgrowth of a desire on the part of electric power companies to render greater service through co-operative effort to the petroleum industry, will hold its sixth annual conference in the Edison Hotel, Beaumont, Tex., December 4, 5 and 6.

The membership of the Petroleum Electric Power Club is not limited exclusively to employes of electric companies. Many allied companies have joined the club and others contemplate joining. The meetings are of such a nature as to be of interest to everyone in the petroleum industry who in any way uses electric power. The following is the program of the meetings which are open to everyone interested:

Tuesday, December 4

9:00 a.m. Registration.

10:00 a.m. Introductory Remarks. W. H. Stueve, chairman, Oklahoma Gas & Electric Co.
Address of Welcome. T. P. Walker, president, Gulf States Utilities Co.
Response. D. C. McKee, Empire District Electric Co.
Message from Oil Companies. J. H. Russell, vice president, Gulf Oil Co., Houston, Tex.
Address. P. B. Doty, president, First National Bank, Beaumont, Tex.

1:30 p.m. Production. E. R. Hubbard, assistant superintendent of production, Gulf Production Co.
Pipe Lines. E. O. Bennett, chief engineer, Continental Oil Co.
Refining. Mr. Wallace, Texas Co.

7:30 p.m. Dinner. Beaumont Country Club. (Oil company representatives invited.)

Wednesday, December 5

9:30 a.m. Present Producing Methods in Oklahoma and Kansas. G. H. Weckel, Kansas Gas & Electric Co.
Economics and Characteristics Involved in Power Sales for Production in East Texas Oil Fields. J. E. Elliott, Southwestern Gas & Electric Co.
Equipment Used in Drilling and Pumping of Oil Wells. C. R. Bayless, engineer, Gulf Production Co.

1:30 p.m. Rate Schedules and Policies for Production. F. M. Austin, Houston Lighting & Power Co.
Developments in Electric Power Industry. A. B. Morgan, Edison Electric Institute, New York City.
Progress Report. W. H. Stueve, Oklahoma Gas & Eletric Co.
Power Club Organization Problems.
Election of Directors.

7:30 p.m. Smoker.

Thursday, December 6

9:30 a.m. Standardization of Oil Field Transformers and High-Line Voltages. E. D. Freeman, Oklahoma Gas & Electric Co.
Power Sales to Pipe Line Companies. F. A. Graham, Kansas City Power & Light Co.
Power Sales to Oil Refineries. A. R. Watson, Gulf States Utilities Co.
Discussion of Methods of Securing Variable Speed Motors for Pipe Line Service and Resultant Economics. W. C. Dreyer, Westinghouse Electric & Manufacturing Co., Pittsburgh, Pa.

1:30 p.m. Co-operative Advertising. W. S. Baugh.
Induction of New Officers.

The present officers of this club are: W. H. Stueve, chairman, Oklahoma Gas & Electric Co., Oklahoma City, Okla.; A. R. Watson, vice chairman, Gulf States Utilities Co., Beaumont, Tex.; W. S. Baugh, secretary-treasurer, Kansas Gas & Electric Co., Wichita, Kans., and O. A. Jennings, honorary member, Oklahoma Gas & Electric Co., Oklahoma City, Okla.

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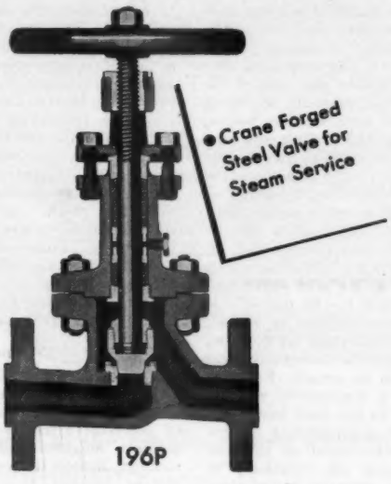

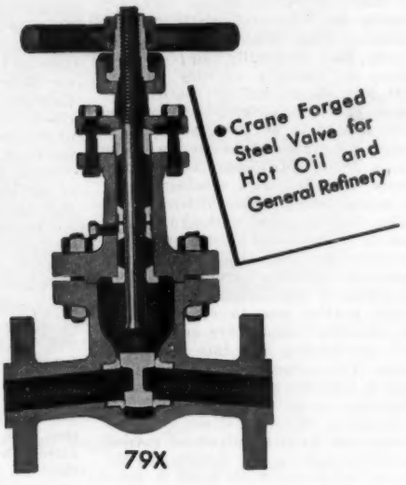

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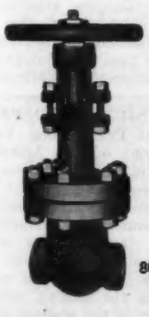

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178½X—Crane Forged Steel Angle Check Valve Screwed

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307D—Crane Forged Steel Cross Valve

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208X—Crane Forged Steel Horizontal Check Valve, Screwed Top

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by the balance between the disgregating effect of this translational energy on the one hand and the aggregating effects of external pressure and intermolecular attractions on the other. Clearly, if temperature be increased a given amount the molecular disgregating translational energy is increased a definite amount, which is independent of temperature level. Now liquid viscosity is a measure of the net effective intermolecular attractions. Hence, equal temperature increments should produce in liquids of equal net attractions, i.e., of equal viscosities, at least approximately equal viscosity decreases, irrespective of the temperature levels. This remarkable conclusion is strikingly confirmed by the data. A plot of, not $d\mu/dt$, but, because of the extreme range covered, $d\mu/\mu\,dt$, i.e., $d\,1n\mu/dt$, the fractional change in viscosity with the temperature versus the viscosity for a large number of liquids, mainly organic but including water, on which data are available, shows deviations from a smooth curve rarely exceeding 20 per cent, and averaging far less, particularly at high viscosities. That liquids so diverse in character, both chemically and physically, differing in viscosity as they do over 10,000 fold, should fall so nearly on a common curve is striking confirmation of the soundness of the analysis here presented. A graphical integration of the curve is shown in Figure 3, in which viscosity is plotted on a semilogarithmic scale against temperature difference. It signifies that viscosity as determined by change in temperature is independent of temperature level, i.e., that all viscosity temperature curves are symbatic. Hence, a knowledge of the viscosity at one temperature enables one to construct the whole viscosity temperature curve.

It is not implied that this relation is absolute. Thus mercury is completely abnormal in behavior relative to this curve. Furthermore, some pure organic liquids are anomalous. However, it can certainly be considered as a standard of normal behavior for pure organic liquids, and the causes of large deviations from it must be sought in some abnormality of character or structure.

Change in Viscosity

Study of Figure 3 will emphasize the point that even the fractional change in viscosity with the temperature increases with viscosity itself. Hence the change in viscosity with temperature rapidly becomes abnormally high at high viscosity levels. On this basis it does not appear hopeful to seek pure viscous liquids of low viscosity-temperature coefficient.

From the point of view of the lubrication engineer, this analysis severely circumscribes the manipulating of the interrelationships of the important physical properties of ordinary hydrocarbon lubricants. Because of the connection between molecular weight, volatility and viscosity, one can hope to find lubricants of low viscosity only among compounds of low molecular weight and high volatility, and vice versa. Even more serious is the limitation that the temperature coefficient of viscosity is determined predominantly by the viscosity itself, i.e., that liquids of high viscosity inevitably have rapid change of viscosity with the temperature. Expressed in the phraseology of the lubrication engineer, the curve of Figure 3 corresponds to liquids of roughly zero viscosity index. It is true that certain pure hydrocarbons exhibit decidedly lower temperature coefficients of viscosity than correspond to this figure, i.e., show higher viscosity indices. This is probably due to some type of molecular interlocking induced by the character of the molecular structure, but it seems likely that potential developments in finding lubricants of high viscosity level and low temperature coefficient of viscosity are limited. Fortunately, however, by fundamentally modifying the structure of the fluid lubricant it is possible profoundly to alter the relationships inherent in pure liquids and their relatively simple mixtures. However, in order to understand these relationships it will be necessary to discuss for a moment the characteristics of two types of fluid in which the lubrication engineer has no direct interest, namely, suspensions and emulsions.

Suspensions and Emulsions

Mathematical analysis shows that the viscosity of a dilute suspension of rigid, spherical particles, uniform in size, is given by the Einstein equation:[4]

$$\mu = \mu_0 (1 + 0.5v)/(1 - v)^3$$

in which μ_0 is the viscosity of the liquid in which the particles are suspended, μ the viscosity of the suspensions, and v the volume fraction of the suspended particles. The viscosity of the suspension is, as the equation indicates, independent of the size of the particles and rate of shear. The relationship has been carefully tested experimentally and is undoubtedly sound. Furthermore, the influence of variation in particle size in a given suspension is not great provided the fractional size distribution remains unchanged, and, while the equation breaks down at high values of v, it still remains true that at these high values the viscosity is a unique function of the volume fraction. There is no doubt that the high viscosity shown by ordinary suspensions is due solely to this Einstein effect, i.e., to the volumetric interference of the suspended particles with the movement of the liquid. Furthermore, the same is true of the viscosity of emulsions of one liquid in another; in other words, the interfering, suspended particles need not be rigid. The resistance to deformation of a small droplet caused by its surface tension is ample to give the effect.

It is clear that change in temperature of either a suspension or an emulsion will make so little change in the volume fraction, v, of the suspended particles that this factor can probably be neglected. If, now, keeping this in mind, one will differentiate the Einstein equation with respect to the temperature and divide the result by the original equation, one finds that the fractional change of viscosity of a suspension with the temperature is that of the solute in which the particles are suspended. However, as just pointed out, the viscosity of the suspension is greater, and in the case of concentrated suspensions far greater, than that of the solvent. Consequently, fluids of this type are characterized by having viscosity-temperature coefficients far lower than correspond to their viscosities. In other words, they do not lie on the curve of Figure 3 for pure liquids. In the phraseology of the lubrication engineer, they possess high viscosity indices. Unfortunately, however, fluids of this type are unsuited as lubricants.

Solutions Exhibiting the Viscosity Characteristics of Suspensions and Emulsions

A large class of materials are known, the so-called emulsoid colloids, which dissolve in suitable solvents without obvious chemical reaction to form solutions whose viscosity is high relative to the concentration of the solute. These solutions exhibit many of the viscosity characteristics of suspensions or emulsions, i.e., they behave as though the solute consisted of large, discrete particles floating in the liquid. However, when the viscosities of these solutions are compared with the values one would anticipate from the Einstein equation, it is found that they are abnormally high. There is every reason to believe that this same volumetric interference of suspended particles is the fundamental cause of the high viscosity exhibited by so-called colloidal solutions of many materials of extremely high molecular weight, although in this case, as will appear later, other important factors enter into the phenomenon. Finally, it is important to recognize that while the shape of the suspended particles has but little effect so long as their dimensions are roughly the same in all directions, rod-like or chain-like particles produce viscosity increases in excess of the solvent out of all proportion greater in relation to the volumetric fraction of the particles. It has long been assumed that this high viscosity was due primarily to a swelling of the particles induced by some sort of combination of solute and solvent, by adsorption or otherwise, the so-called solvation, and it still seems likely that this is an important factor in many cases. However, in recent years Staudinger in Germany, supported by the results of many other workers, has offered convincing evidence that in many cases another factor is fundamentally important, if not indeed predominant. Staudinger has shown that solutions containing solutes of high molecular weight and extremely long, chain-like molecular structure exhibit the viscosity characteristic outlined above in high degree, even in cases in which there is little or no supporting evidence of solvation. Staudinger explains this fact by modifying the concept underlying the Einstein equation. That equation assumes that the high viscosity of a suspension of rigid, spherical particles in a liquid is due to the interference of the particles with the liquid flow, and it is not difficult to visualize that this interference would depend primarily on the volumetric fraction of the suspended particles. Staudinger points out that, if the suspended particles, instead of being spheres, are in fact long, rod-like bodies, in viscous flow, in which alone the phenomenon of viscosity exhibits itself, these rods are sure to turn and tumble in the moving fluid. Clearly, the tendency of the rods to interfere with each other, and therefore with the motion of the fluid, is far greater than the tendency of spheres of equal volume. Staudinger postulates that the effective interfering tendency is proportional, not to the volume of the rods, but to the volume of the cylinder of revolution generated by rotation of the rod about an axis through its center perpendicular to its length. Furthermore, in at least a qualitative way he and other workers in the field have been able to confirm the dependability of this assumption by measurement of the viscosity characteristics of solutions of chain compounds of the type in question, synthesized by dependable methods and of accurately known molecular weights. Staudinger's formula leads to the conclusion that the viscosity of a solution of this type is a function not only of the volumetric fraction of solute, v, but also of the molecular weight, increasing rapidly with the latter. However, exactly as in the case of suspensions, this leads to the conclusion that the temperature coefficient of viscosity of the solution is that of the solvent, since the molecular weight changes even less with the temperature than the volume fraction of solute. In other words, defining Staudinger viscosity as the unduly high viscosity imparted to a solution by an emulsoidal solute of high molecular weight and chain-like structure, Staudinger viscosity gives to the lubricating engineer the possibility of attaining the high viscosities characteristic of pure compounds of extremely high molecular weight, combined with the low temperature coefficients of viscosity inherent, in the case of pure substances, only in those of low viscosity and low molecular weight.

The possibilities just outlined open a new field of development for the lubrication engineer, but its characteristics must be exploited on the basis of experience. However, one can point out certain pitfalls to be avoided. In the first place, it is obvious that the solutes employed must be adequately stable under conditions of practical use. In the second place, they must be soluble in the low-viscosity diluents available, and these in turn must be suitable in stability, volatility, and other characteristics. Most important of all, however, in the synthesis of the thickening agents one must secure a proper balance in molecular weight.

From the point of view of securing a maximum viscosity increase with a minimum of addition agent, one would prefer a solute of maximum molecular weight. However, the interference of such solute molecules with each other in solution becomes excessive and they tend to develop a structure, perhaps best described by the phrase "brush heap." The formation of this structure is the cause of the phenomenon of gelation. When it develops, the liquid no longer has a constant viscosity, but its viscosity changes rapidly with rate of shear, even at low rates of distortion. Indeed, it requires a finite force to produce even differential rate of flow. In other words, the solution has taken on the properties of plasticity, and is no longer a liquid in the strict sense of the term. In general, such a liquid possesses a specific gelation temperature, above which it will not develop a gel structure; but, unfortunately, even at temperatures distinctly above the gel point the tendency toward structure formation is evidenced in a rapid rise in viscosity as temperature falls. Indeed, the viscosity-temperature curve of such liquids extrapolates to infinite viscosity at the gel temperature. This is most easily seen by plotting, not viscosity, but its reciprocal, fluidity, which frequently is practically linear with the temperature, extrapolating to zero value at the gel point. This means that the Einstein equation in the sense defined above, even as modified by Staudinger, breaks down as the temperature of gelation is approached. Hence, emulsoidal solutions of this type, instead of having temperature coefficients lower than those of pure liquid of the same viscosity, have in the neighborhood of the gel point coefficients which are far higher, i.e., rather than exhibiting high viscosity indices they show negative values which may become very large. Consequently, while to get a marked Staudinger viscosity effect it is necessary to have molecular chains of high molecular weight, it is equally essential to avoid excessive values.

Summary

The modern physical concept of the structure of the molecule, leading as it does to the assumption of the existence of powerful attractive forces in the immediate neighborhood of the molecular surface, makes it possible to get a far clearer picture than hitherto of the mechanism of liquifaction. This leads to qualitative explanation of the influence of molecular weight and molecular structure on volatility and boiling point, on liquid density and viscosity. It gives a clear picture of the reasons for the differences in viscosity behavior between liquids and gases, particularly the influences of temperature and pressure. It leads to the unexpected conclusion that for pure liquids the temperature coefficient of viscosity is determined predominantly by the viscosity itself, always resulting in extremely high temperature coefficients for viscous liquids. However, modern knowledge of the properties of what may be described as nonhomogeneous liquids, consisting of mixtures of large, chain-like molecules with ordinary liquids, makes it possible to prepare liquids of abnormally low viscosity-temperature coefficients relative to their viscosities. Mixtures of this type hold promise of developing extreme importance in the field of lubrication, particularly of hydrocarbon lubricants.

[4] For low values of v this simplifies to the form frequently met, $\mu = \mu_0 (1 + 2.5\,v)$.

GEOPHYSICAL PROSPECTING

Geophysical Prospecting, Volume 110, of Transactions of the American Institute of Mining and Metallurgical Engineers has been published, the third of a series sponsored by this society. This volume transmits the principal papers accepted by the institute since 1932, many of them never before published. Some of these papers treat problems of prospecting in the mining industry. All are of interest to the student of geophysical prospecting and several have direct application to the problems of the petroleum industry.

The book contains 14 papers on electrical methods, 5 on magnetic methods, 5 on seismic and 2 general. Discussions accompany many of the papers. The book contains 583 pages and is fully illustrated. It sells for $5 net and may be secured from the headquarters of the American Institute of Mining and Metallurgical Engineers, 29 West Thirty-ninth Street, New York City.

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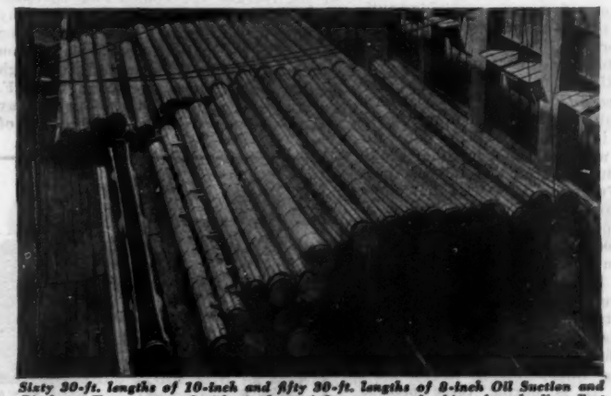

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Motor Oils Having Viscosity Index of 120 Predicted as Definite Need

By M. OTTO, F. L. MILLER, A. J. BLACKWOOD and G. H. B. DAVIS
Standard Oil Development Co.*

The average motorist travels greater distances and at appreciably higher driving speeds each year. Improved highways in all parts of the country, combined with car speeds up to and above 85 miles per hour, have brought this about. Furthermore, most states having severe winters now have facilities for keeping these highways open in even the worst weather, and this has resulted in an enormous increase in long-distance driving the year round. Yearly mileages of 30,000 to 50,000 miles are far from uncommon, and average driving speeds of 40 miles per hour—necessitating 50 to 60 miles per hour in the open stretches—are the rule rather than the exception.

Since the typical automobile represents an investment of some $700 and a yearly operating cost of about $500, it is not surprising that the petroleum and automotive industries have found the average motorist giving increased attention to the proper lubrication of his car when driving under these more severe conditions. He has very definite ideas as to what he wants the lubricant to do, and he is not at all unreasonable in his demands. Certainly, no progressive marketer of oils can overlook these needs and demands, and it is the purpose of this paper to summarize how recent developments in motor oil manufacture are meeting them.

Motorist's Views

From the motorist's point of view there are essentially only two seasons of the year—summer and winter. Summer includes that part of the year when motoring is pleasant and temperatures are definitely above freezing. Winter includes the months when temperatures may at any time drop below freezing in a matter of hours, requiring antifreeze in the radiator, especially good gasoline for starting and warming up, and a motor oil which will permit of quick starting.

A picture of the length of summer for the United States as defined above is shown in Figure 1. The data for this plot were taken from the U. S. Weather Bureau statistics for the past 25 years. From this it is seen that along the Gulf and Pacific coasts "summer" conditions prevail the year round. In the area commonly referred to as the "Deep South," "summer" lasts from March to November. For over half of the United States, including the industrial East and the agricultural Middle West, "summer" normally lasts from May to October; while in the Rocky Mountain region it covers only the period from June to September. It is during these months that by far the greatest amount of high-speed driving is done, and a large portion of it is done when the mid-day temperatures range between 80° F. and 100° F. The lubrication requirements under such conditions are particularly exacting.

In general there are five characteristics that a good "summer" oil should possess. These are:

1. Low consumption.
2. Low carbon- and sludge-forming tendency.
3. Ability to give safe lubrication.
4. Maintain piston seal (freedom from ring sticking).
5. Free flowing in cool weather.

Low Consumption

A recent survey[1] of several thousand motorists showed that low oil consumption is the one property most desired by the operator, over 50 per cent placing this as the foremost requirement. This is not simply a question of oil economy. Tests made by Wilkin[2] showed that when high-viscosity oils are used to obtain low oil consumption, there was a corresponding increase in gasoline consumption which slightly over-balances the savings in oil cost. This is confirmed by data reported by Graves, Mougey, and Upham.[3] It is rather a question of freedom from worry as to whether the oil is running low or a guarantee that the investment represented by the car is amply protected from sudden loss. One of the foremost automotive engineers in the country recently remarked that the average motorist is content to stop frequently for fuel, but hates to have the hood of the car lifted: that, were the oil filler at the rear of the car along with the gasoline filler, there would be a negligible number of complaints on oil consumption. Be that as it may, the motorist of today wants, first of all, low consumption with the lubricant he uses.

Low Carbon and Sludge

There exists a popular belief that a long hard drive will burn out the carbon in an engine. This is partly true, provided the carbon is the result of slow-speed city driving, and is of the sooty or soft flaky type. Actually on a hard drive, especially when an excess of oil reaches the combustion chamber, a very hard carbon accumulation may develop—resulting in higher operating temperatures and excessive detonation and preignition. Furthermore, the high piston temperatures (reaching 650° F. on the underside of the crown) may cause excessive oxidation and coking of the oil at that point. This coke eventually drops down into the oil; and may, with some lubricants, mix with gummy oxidation products to form sludges which clog oil screens and oil lines and ultimately burn out bearings. A satisfactory oil for high-speed summer driving should be low-carbon and stable to oxidation to insure cool running, freedom from knock, freedom from sludge, and possible bearing failure.

Safe Lubrication

Many tests[2,4] have been recorded to show that even the lightest motor oils on the market are sufficiently viscous to give safe lubrication. On the other hand, there has always been the feeling among garage mechanics and maintenance superintendents that an oil must possess a certain "body" (particularly when drained hot) to insure lubrication. This conflict between scientific observation and popular conception is probably based on the fact that most engine tests are carried out on motors in good condition, whereas the garageman's observations are made on a wide variety of cars in every conceivable mechanical condition—including a large percentage driven by people who often mistreat the car.

Since lubrication service is primarily a sort of insurance against all possible risks of damage, it is highly desirable to market an oil which has sufficient factor of safety to meet all the demands made upon it, and for this reason it is better to err on the side of too much safety rather than too little.

Piston Seal

It can be demonstrated that an engine with badly worn piston rings, but otherwise in perfect condition, will develop almost its normal horsepower. Why, then, should it be important for the oil in an engine to maintain good piston and piston-ring seal when by so doing the saving in power and fuel is negligible? The results of poor piston seal are, broadly speaking, three in number:

1. While the loss of combustion products is insufficient to reduce power seriously, these products do heat up the protective oil film to abnormally high temperatures—resulting in break-down of the oil, and reducing its viscosity to dangerously low values. This leads to coking in the ring zone and eventual sticking of the rings in their grooves, plus abnormal wear due to the reduced viscosity of the oil on the sliding surfaces.
2. When the rings become tight or stuck, they no longer are efficient in transmitting heat from the piston to the cylinder wall—resulting in increased piston temperatures. In extreme cases the pistons expand with the heat sufficiently to seize and score the sliding surfaces. In less extreme cases an increase in detonation may be experienced, together with an increase in oil consumption due to poor scraping by the rings. The increased oil consumption may, and ordinarily does, result in excessive carbon deposits in the engine. Increased piston temperatures cause more coking on the undersides of the piston, and a vicious cycle is started. This coke gradually falls into the crankcase to form the well-known "coffee-grounds" type of deposit.
3. The sticking of rings permits excessive dilution during idling periods, and allows products of combustion—water, soot, and acidic compounds—to reach the crankcase during the entire time the engine operates. This condition will bring about excessive sludge accumulation in the engine, with resultant ill-effects.

Thus, while poor piston seal of itself is harmless, the consequences are far-reaching and extremely vicious. To maintain a good piston seal is perhaps the most important single requirement the oil must meet; and to do so it must be chemically stable, retain its viscosity with increase of temperature, and be as free from carbon as possible.

Free Flowing

This seems at first thought to be an unnecessary requirement for a summer oil; but, as previously explained, the average motorist recognizes only two seasons, and the summer months include those when early-morning temperatures approach freezing. Consequently, increasing viscosity to reduce oil consumption has its limitations in that it may be difficult to start the car in moderately cold weather. The limitation on viscosity at, say 40° F., is not as severe as it would be at zero or below, because battery efficiency is greater at the higher temperature. Data are available[5] showing that starter torque is some 25 per cent greater at 40° F. than at 0° F. Since the average car will barely start at 0° F. with an oil having a viscosity* of 30,000 seconds at 40° F., the limiting

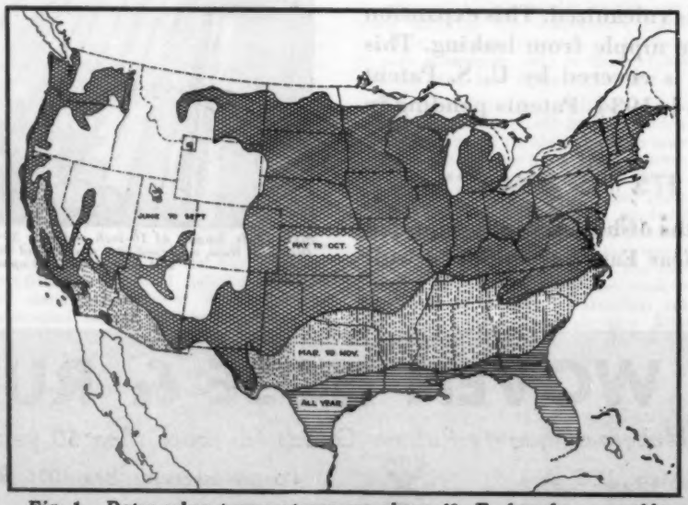


Fig. 1. Dates when temperatures are above 40 F., based on monthly average daily minimum temperatures

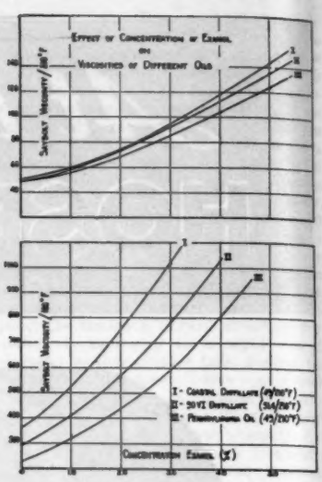
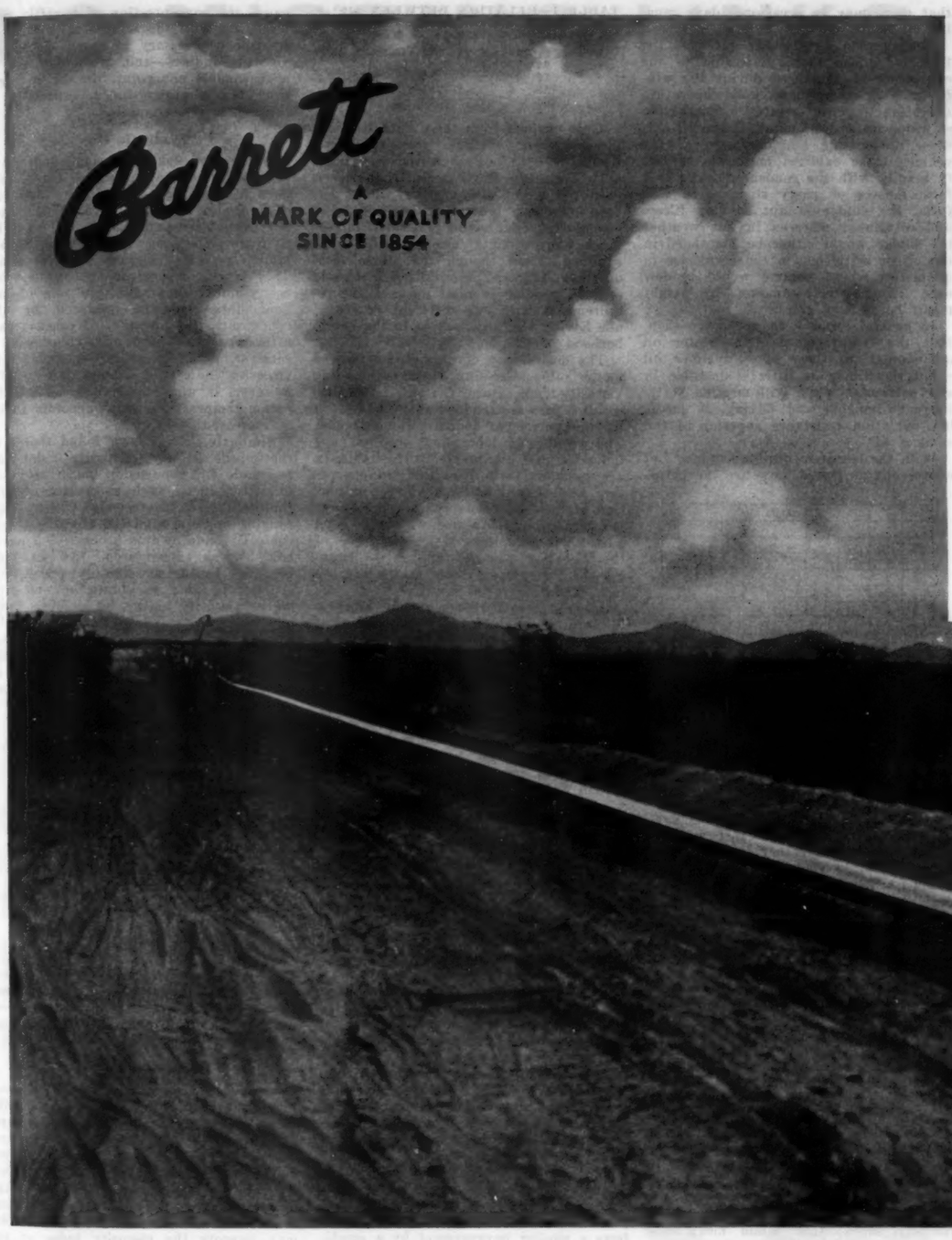

Effect of Concentration of Exanol on Viscosities of Different Oils
Saybolt Viscosity (sec.)
Concentration Exanol (%)
I - Coastal Distillate (29/30°)
II - 30 VI Distillate (31/28°)
III - Pennsylvania Oil (42/170°)

Fig. 2. Effect of the concentration of Exanol on the viscosities at 100° F. and 210° F.

*Presented before annual meeting of A.P.I. at Dallas. Author's title, "Improved Motor Oils."

*Here and elsewhere throughout this paper it is understood that, unless otherwise stated, viscosity is determined by the Saybolt Universal viscosimeter.



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viscosity will be about 37,500 seconds to 40,000 seconds. Possibly of equal importance are the pumping characteristics of the lubricant.

Ordinarily, the pourpoint—or for certain oils 10° F. below the pourpoint—is regarded as the limitation on pumpability; and on this basis pumping at 40° F. should offer no problem. Actually, on many cars on the road today the oil is not pumped in adequate quantities to give safe lubrication when viscosity exceeds 25,000 seconds to 35,000 seconds. Above this viscosity, oil does not flow readily through the oil-pump screen, and the pump cavitates. Probably 40,000 seconds at 40° F. is the limiting viscosity for a wide-range summer oil.

In view of the above, the low-temperature characteristics of summer oils cannot be entirely overlooked. Since there exists a limitation on maximum viscosity at moderately low temperature, and since at the same time high viscosity is required at elevated temperature, the use of an oil of unusually good viscosity index is essential. For example, taking battery characteristics into consideration on the above basis, an SAE-50 oil of 100 seconds at 210° F. would permit starting at 51° F. if of 0 viscosity indnex; at 43° F. for 50 viscosity index, at 29° F. for 90 viscosity index, and at 14° F. for an oil of 120 viscosity index.

Consideration of the conditions encountered in winter operation indicate that the requirements for a winter oil are essentially those of a summer oil as given above, excepting that certain limitations are imposed upon the lubricant as a result of the lower temperatures encountered. The factors affecting cold starting, as influenced by the oil, have been covered in several papers[5,6,7] before the Society of Automotive Engineers, and in general are well recognized. The tentative 10-W and 20-W specifications for oils have resulted from this

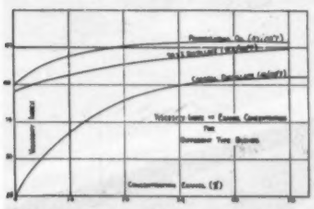

Fig. 3. Effect of the concentration of Exanol on the viscosity index

knowledge, and this phase of winter-oil requirements need not be enlarged upon here. Pumpability, while vitally important in winter oils, is perhaps of less importance than in summer oils; since—if pourpoint is satisfactory—it is reasonably correct to say that, if the oil is sufficiently low in viscosity to permit starting in severe weather, its viscosity is not high enough to present any pumping problem.

However, people still desire low consumption for winter driving—recognising, of course, that if starting is to be obtained some sacrifice on consumption is necessary. A very careful analysis of U. S. Weather Bureau statistics over the past 25 years has shown that, on the average, the variation between the coldest 10 per cent of the days in a given month and the warmest 10 per cent of the days in the same month is 42° F. Furthermore, this change may occur over a single 24-hour day, and the variation is substantially the same for all parts of the country. This means that, in a region experiencing temperatures of —10° F., temperatures above freezing may be encountered practically overnight. To obtain easy starting, coupled with good consumption, it is essential that the oil used should have the highest possible viscosity at elevated temperatures compatible with a viscosity which will assure starting. This requirement is doubly important when it is considered that winter, as the automobile driving public interprets the term, means those months when the minimum temperature is below 30° to 40° F., and that there may be occasional days ranging up to 70° and 80° F.

Tendency to form sludge—at least the type of sludge most noticeable to the car owner—is enhanced during the winter months where more low-temperature operation permits greater condensation of water inside the engine. If the oil oxidizes during the hot operation of the vehicle, these oxidized materials emulsify readily with the condensed water and form masses of pasty sludge. In this form, the sludge is apt to clog filters and oil lines; whereas in hot weather the sludge would either be suspended in the oil or settle out in the crankcase in quantities whose volume would be low even though their amount by weight might be just as great.

In general terms it may be said, then, that the requirements of a winter oil are similar to those of a summer oil—but sacrificing as little as possible in any particular while still meeting starting requirements and having, if possible, oxidation resistance superior to the summer oil.

With the requirements for summer and winter oils as stated, how are the petro-

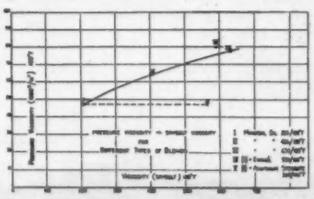

Fig. 4 Effect of pressure upon the viscosity of oils

leum and automotive industries meeting them? The present method is to recommend constantly changing grades to take care of conditions as they arise. While this offers a reasonably satisfactory solution insofar as the manufacturer of cars and the marketer of oils is concerned, it is far from satisfactory from the consumer's point of view. He wants to use, at most, two oils during the year. The ideal would be, of course, one oil satisfactory the year round—having low viscosity to take care of the coldest winter weather, and high viscosity to give good consumption in abnormally hot weather, and for hard driving. In addition, it should possess those other requirements guaranteeing freedom from carbon, sludge, and ring sticking. For those areas having wide temperature limits during the year, this ideal oil has not as yet been made.

Such an oil would have to have a viscosity at least as low as 20,000 seconds (extrapolated) at 0° F. for easy winter starting and—depending upon the type, condition, etc., of the car in which it would be used—viscosities at 210° F. ranging from 65 seconds up to 100 seconds for summer operation. In terms of viscosity index, this would mean oils ranging from 125 viscosity index* for the 65 second oil up to 139 viscosity index for the 100 second product (Table 1). Oils having these viscosities at 210° F., but of less than 20,000 seconds at 0° F. (as would be required for ease of starting in some of the colder sections of the country) would necessarily possess even higher viscosity indices.

*Determined by extrapolation of Dean and Davis viscosity index system (Dean and Davis, Chem. & Met. Eng., 36, 618 (1929)) beyond 100 viscosity index.

TABLE 1—RELATION BETWEEN 210° F. VISCOSITY AND VISCOSITY INDEX FOR OIL OF 20,000 SECONDS AT 0° F.

Viscosity at 210° F.	Viscosity index
65	125
75	131
85	135
100	139

It is obvious from these data that the ideal oil for average year-round use would have to possess a viscosity index of above 125. Until recently, however, even the oil of 125 viscosity index has been merely a laboratory curiosity, and commercial oils having viscosity indices much above that figure are still to be attained. Even though the single ideal oil may fail to materialize, it should still be possible to meet most of the requirements with two different grades of oils having viscosity indices in the neighborhood of 120.

The desirability of obtaining improved motor oils possessing such outstanding viscosity-temperature characteristics has resulted in a tremendous amount of work by the petroleum industry to this end. The results of laboratory studies have indicated that oils of high viscosity index are predominantly paraffinic in character, i.e., they contain a large proportion of molecular compounds which have paraffin groups in some way associated with their structure.[8,9] This is true of the so-called paraffin-type oils—including the Pennsylvania oils, which are the most familiar representatives of this class, and which represent one extreme for ordinary mineral oils—and also of many others, such as the Mid Continent type, which are also paraffinic, although slightly less so than the Pennsylvania oils. Coastal oils, on the other hand, are noticeably deficient in the pariffin-type compounds, and represent the other extreme for mineral lubricants. Paraffin wax itself probably possesses the highest viscosity index of any known hydrocarbon "oil".

Improving Viscosity Index

Intensive efforts have been made by the petroleum industry to improve the paraffinicity of mineral oils in order to obtain improved viscosity index and the accompanying benefits. Included among the different methods which have attained a certain degree of success are:

1. Hydrogenation[10]
2. Solvent extraction[11, 12, 13, 14, 15, 16]
3. Aluminum-chloride treatment[17]
4. Fuming sulphuric acid

Hydrogenation brings about improvement in the paraffinic nature of an oil, probably by rupturing some of the ring compounds to form paraffin chain-like compounds and causing various molecular re-arrangements. Solvent extraction—by means of a varied line of solvents including phenol,[11] nitrobenzene,[12] β,β-dichloroethyl ether[13] cresylic acid,[14] furfural,[15] and others[16]—accomplishes this by dissolving out the less paraffinic constituents and thereby concentrating the more paraffinic ones. Aluminum chloride effects a similar improvement by a combination of chemical re-arrangement of the molecules and the polymerization of the less desirable portions of the oil in the form of sludges. The action of fuming sulphuric acid is probably in many ways similar to that of aluminum chloride, except that it also includes a certain solvent-extraction effect.

In spite of their relative merits, however, all these processes are limited in the extent to which they can improve the viscosity index of an oil, largely because the concentration of paraffin wax builds up with the increasing severity of treatment necessary to reach the higher viscosity indices—and, when dewaxed to a reasonable pourpoint, the oil is rarely over 115 viscosity index, especially in the higher viscosity oils.

Synthetic Oils

Studies of synthetic compounds have also indicated that it is possible to produce oils of high paraffinicity and viscosity index, although such products are not available commercially. The work by Sullivan, Voorhees, Neeley, and Shankland especially deserves consideration.[18] This work demonstrated that high-viscosity-index isoparaffin-type oils of low pourpoints could be produced by the condensation of unsaturated cracked paraffin wax with aluminum chloride as a catalyst. When such oils were made with viscosity indices of around 110 to 115, however, it was found that the solidification temperatures or pourpoints rapidly increased.

Similarly, it has been found that synthetic oils of high viscosity index can be made by condensing paraffins with aromatic nuclei such as benzene, naphthalene, etc. Extremely viscous oils, ranging up to around 120 viscosity index, could be made by this process—but again trouble was encountered in obtaining products having satisfactory pourpoints. It was possible to obtain oils of even higher viscosity indices by blending these oils with relatively-low-viscosity neutrals. Surprisingly, certain of the blends possessed viscosity indices higher than either of the two components, and in several cases blends having as high as

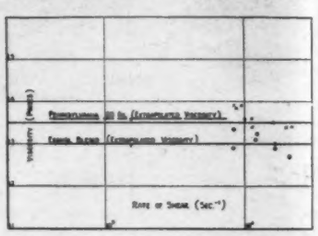

Fig. 5. Pressure Viscosities at 77° F.

125 viscosity index were obtained. Because of costs and other considerations, however, these oils have not offered promise of developing into commercial motor lubricants.

Blended Oils

There are also other ways of improving the viscosity index of mineral oils which deserve mention, but which are not extremely sucessful. One method involves the use of small quantities of rubber—which one might logically consider to be an extremely long aliphatic hydrocarbon—as a mineral-oil blending or thickening agent. Although rubber may improve the viscosity index of an oil, it tends to impart other undesirable characteristics. It renders the oil "stringy" in nature and, because of its high unsaturation, is readily susceptible to heating and oxidation—which causes the formation of precipitate or sludge. Further, because of its extremely high molecular weight, it readily undergoes mechanical break-down (loss in molecular weight) in service, with a resultant loss of viscosity and viscosity index.

A second method consists in blending a mineral-oil base stock with fatty oils, most of which in themselves possess high viscosity indices. These blends, however, are characterized by instability, and often cause separation of sludge in the engine—as well as demonstrating tendencies toward ring sticking and piston scoring, which the fatty oils themselves display if employed over an extended period or under severe service. This instability renders them unsuitable as automotive engine lubricants.

The net result of the studies to date, as will be observed from the immediately preceding paragraphs, has been the strengthening of the conclusion that the highest possible degree of paraffinicity is needed to obtain high viscosity indices.

TABLE 2—EFFECT OF EXANOL UPON VISCOSITY AND VISCOSITY INDEX OF DIFFERENT OILS

Base oil—	Concentration (per cent)	Viscosity at 100° F.	Viscosity at 210° F.	Viscosity Index
Coastal distillate	0	358	49.2	26
	0.5	441	54.0	51
	1.5	627	66.0	80
	3.0	1,020	91.5	99
	5.0	1,851	147.5	111
90 Viscosity index distillate	0	296	51.4	91
	0.5	343	55.4	100
	1.0	413	60.6	106
	2.0	561	73.0	114
	5.0	1,323	136.0	125
Pennsylvania oil	0	237	49	100
	0.5	273	52	106
	1.0	332	58.4	119
	2.0	433	68.6	126
	5.0	1,050	124.0	128

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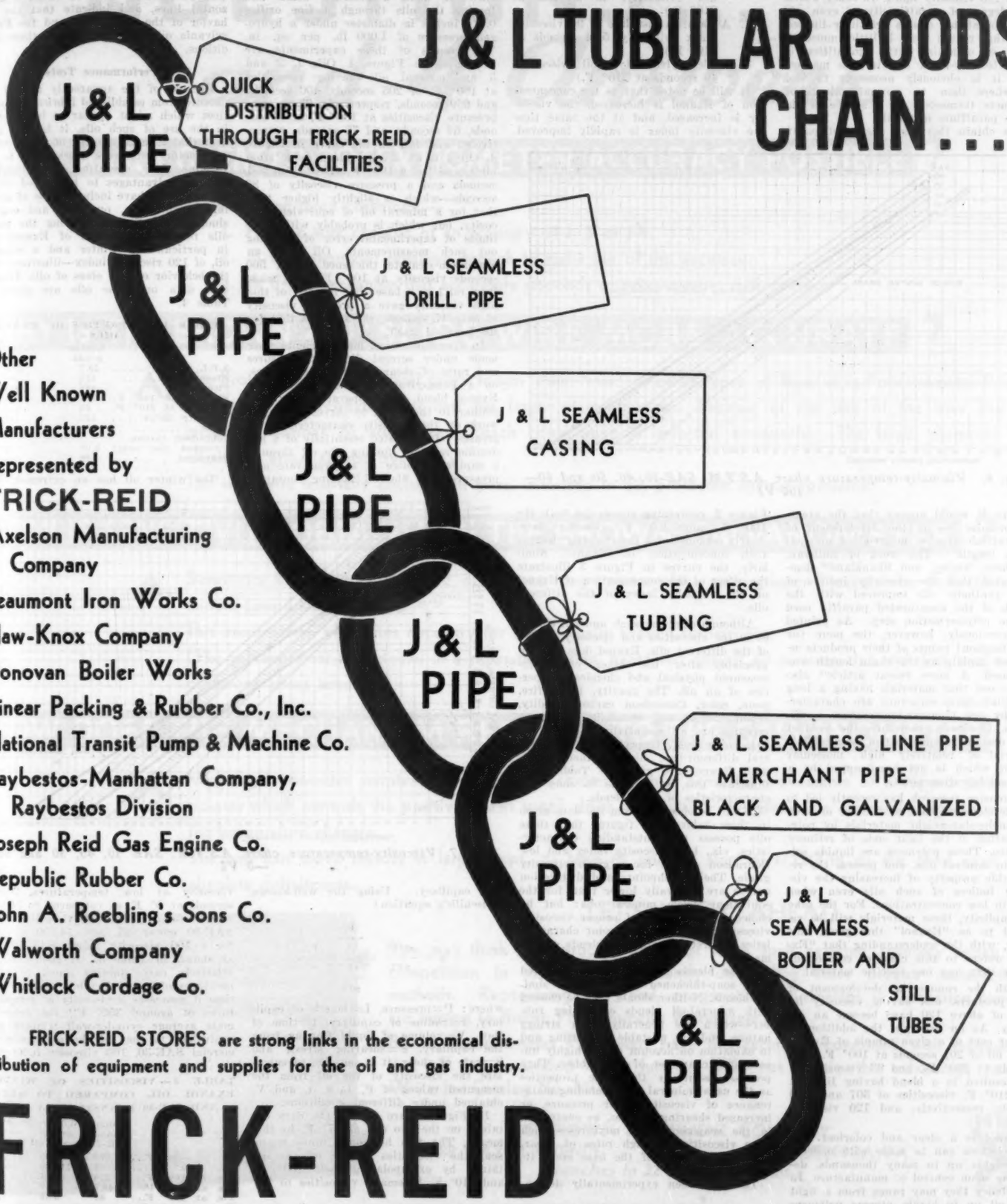
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It has become apparent, however, that the upper limit which can now be reached in commercially refining mineral oils by the available refining methods is less than 120 viscosity index. In other words, the degree of paraffinicity of even the most paraffinic oils is definitely limited. For that reason there is little immediate hope of obtaining large quantities of high-viscosity-index oils in this manner, and it is obviously necessary to look elsewhere than to normal mineral-oil products themselves as a source of the more paraffinic materials.

To obtain this high degree of paraffinicity it would appear that the greatest promise lies in the development of a paraffinic type of material of unusual chain length. The work of Sullivan, Voorhees, Neeley, and Shankland[18] demonstrated that the viscosity indices of their synthetic oils improved with the length of the unsaturated paraffin used in the polymerization step. As pointed out previously, however, the pour (or solidification) points of their products increased rapidly as the chain length was increased. A more recent article[19] also points out that materials having a long paraffinic-chain structure are characterized by low viscosity-temperature coefficients. Obviously, therefore, the product most desired is some sort of isoparaffinic material of relatively high molecular weight which is not handicapped by a high solidification point.

Extensive research has recently led to the development and production of such high-molecular-weight materials by polymerization of the light ends of refinery gasoline. These polymers are liquids soluble in mineral oils, and possess the remarkable property of increasing the viscosity indices of such oils even when used in low concentrations. For the sake of simplicity, these materials will be referred to as "Exanol" throughout this paper, with the understanding that "Exanol" refers to this class of compounds rather than any one specific material.

With the commercial development of such products, oils having viscosity indices of above 120 have become an actuality. As an example, the addition of 1.3 per cent of a given sample of Exanol to an oil of 201 seconds at 100° F., 46.4 seconds at 210° F., and 93 viscosity index resulted in a blend having 100° F. and 210° F. viscosities of 307 and 56.5 seconds, respectively, and 120 viscosity index.

Exanol is a clear and colorless substance which can be made with molecular weights up to many thousands, depending upon control of manufacture. In consistency they may range from a light fluid oil up to highly viscous polymers which barely flow. They are pure hydrocarbons, essentially saturated in character, possessing a hydrogen-carbon ratio of 2.0—as would be expected of high-molecular-weight paraffinic materials.

The effect of Exanol upon the viscosities and viscosity indices of several types of mineral oils is illustrated by the data in Table 2 and in Figures 2 and 3. In Table 2 are summarized the data obtained with blends of a typical grade of Exanol in three different representative types of oils.

1. A Coastal oil of low viscosity index (viscosity, 49 seconds at 210° F.)
2. A paraffin distillate of 90 viscosity index (viscosity, 51.4 seconds at 210° F.)
3. A Pennsylvania-type oil (viscosity, 49 seconds at 210° F.)

It will be noted that as the concentration of Exanol is increased, the viscosity is increased, and at the same time the viscosity index is rapidly improved.

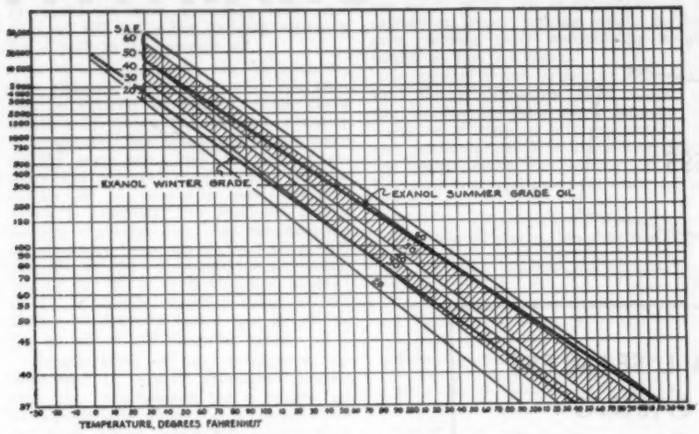

Fig. 6. Viscosity-temperature chart, A.S.T.M. SAE-30, 40, 50 and 60—100 VI

Figure 2, containing curves for both the 100° F. and 210° F. viscosity data, clearly demonstrates the viscosity changes with concentration of Exanol. Similarly, the curves in Figure 3 illustrate the effect of the concentration of Exanol on the viscosity index of the different oils.

Although effecting such unusual changes in the viscosities and viscosity indices of the different oils, Exanol does not appreciably alter the other commonly-measured physical and chemical properties of an oil. The gravity, flash, fire, pour, color, Conradson carbon, acidity, saponification, and demulsibility characteristics are all essentially those of the base stock itself. Inspection data on several different-base oils and their blends with Exanol are given in Table 3 to illustrate this, as well as to show the characteristics of such blends.

It will be observed from the data given in these tables and figures that these oils possess two outstanding characteristics, viz., high viscosity index and low Conradson carbon for a given viscosity grade. Their flashpoints and distillation curves are naturally lower than for the equivalent grade mineral oils; but by choice of base stocks of proper viscosity, viscosity-index, and flashpoint characteristics, entirely satisfactory blends can be made.

These blends should not be confused with soap-thickened oils or other similar blends. Neither should they be classed with mineral-oil blends containing rubber—which are generally of a stringy nature, and are unstable to heating and to oxidation on account of the highly unsaturated character of the rubber. They possess essentially the same properties as the usual mineral oils, including maintenance of viscosity under pressure, or increased shearing stresses, as contrasted to the soap-containing mixtures—which have viscosities at high rates of shear, approaching those of the base stock itself.

This has been experimentally demonstrated by viscosity studies at high pressures. In one series measurements were made on several mineral oils, an Exanol blend, and an aluminum-stearate thickened oil, using a pressure bomb and forcing the oils through a fine orifice 0.014 inches in diameter under a hydrogen pressure of 1,000 lb. per sq. in. The results of these experiments are illustrated in Figure 4. Oils 1, 2 and 3 are mineral oils having viscosities at 100° F. of 205 seconds, 406 seconds, and 630 seconds, respectively. These gave pressure viscosities at 100° F. of 47 seconds, 64 seconds, and 78 seconds, respectively; and fall on the curve in Figure 4. Oil 4 is an Exanol blend made from oil 1, and has a 100° F. viscosity of 591 seconds and a pressure viscosity of 80 seconds—which is slightly higher than that for a mineral oil of equivalent viscosity, but which is probably within the limits of experimental error of carrying out such measurements. Oil 5 is an aluminum-stearate thickened oil of 560 seconds viscosity at 100° F., also made from oil 1 as a base; but in spite of this high viscosity gave a pressure viscosity of only 47 seconds, the same as that for the base oil itself.

In a second series, measurements were made under several different pressures and rates of shear, or shearing stresses, on a Pennsylvania-type oil and on an Exanol blend. The apparatus used was similar to that used by Arveson[20] in his work on the viscosity characteristics of greases. It consisted essentially of a hydraulic ram for forcing the oil through a capillary orifice at a given rate and pressure, and the oil holding container and capillary. Using the well-known Poiseuille's equation:

$$\eta = \frac{\pi r^4 Pt}{8VL} = \frac{\frac{Pr}{2L}}{\frac{4V}{\pi r^3 t}} = \frac{F}{S}$$

where: P=pressure, L=length of capillary, r=radius of capillary, t=time of flow, V=volume of liquid flowing from the capillary, F=shearing stress, and S=rate of shear, it is possible to calculate the viscosity of the oil from the measured values of P, L, r, t, and V, obtained under different conditions.

In Figure 5 are plotted the data obtained on the two oils at 77° F. by this means. The two horizontal lines represent the viscosities of the oils as obtained by extrapolating their 100° F. and 210° F. kinematic viscosities to 77° F. by means of the familiar A.S.T.M. viscosity-temperature chart. The experimental points obtained under the higher pressures, or higher rates of shear—as will be observed—fall on the two horizontal lines, and indicate that the behavior of the Exanol oil and the Pennsylvania oil are similar under these conditions.

Performance Tests

Because of the apparently radical departure from established lubrication practices which might appear to be involved in the use of such oils, it is only natural that a large number of experiments and motor tests were carried out to determine their operating characteristics and the advantages to be gained therefrom. These have included ease of starting, consumption, pumping, and engine-sludging experiments. Among the many oils tested, two grades of Exanol oils in particular—a winter and a summer oil, of 120 viscosity index—illustrate well the behavior of this class of oils. Inspection data on these oils are given in Table 4.

TABLE 4—PROPERTIES OF EXANOL OILS

	Winter grade	Summer grade
A.P.I. gravity	29.7	28.6
Flashpoint	415	435
Firepoint	465	490
Viscosity at 100° F.	351	986
Viscosity at 210° F.	60	102
Viscosity index	121	117
Color	8½	8½
Conradson carbon residue (per cent)	0.05	0.42
Pourpoint	—20	—5

The winter oil has an extremely low viscosity at low temperatures, 20,000 seconds at 0° F. as compared to 50,000 seconds for a typical 100 viscosity index, SAE-30 motor oil, and 14,000 seconds for a 100 viscosity index, SAE-10 oil, as shown in Table 5. It should allow relatively easy starting down to temperatures of —10° F.; but at the same time it possesses a viscosity at temperatures of around 350° F., the approximate average cylinder-wall temperature, equivalent to that of the average commercial SAE-30, 100 viscosity index oil.

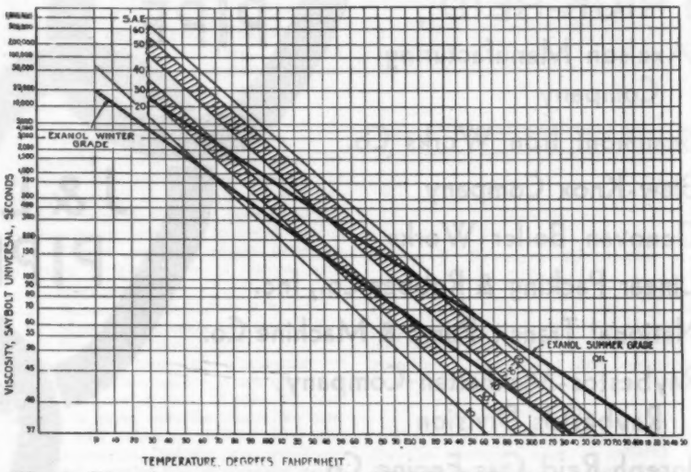

Fig. 7. Viscosity-temperature chart, A.S.T.M. SAE 30, 40, 50 and 60.—0 VI

TABLE 3—PHYSICAL PROPERTIES AND EXANOL BLENDS

	Paraffinic Base stock "A"	Base stock "A" + Exanol	Paraffinic Base stock "B"	Base stock "B" + Exanol	Paraffinic Base stock "C"	Base stock "C" + Exanol
A.P.I. gravity	30.7	30.7	30.3	29.6	28.6	28.5
Flashpoint (deg. F)	420	420	425	425	445	440
Viscosity at 100° F.	195	343	254	593	488	822
Viscosity at 210° F.	45.5	60	49.2	77.8	64.6	92
Viscosity index	98	123	92	119	100	117
Color	22¾	20¾	17¾	17	1⅛	1⅛
Conradson carbon residue (per cent)	0.008	0.014	0.018	0.021	0.722	0.794
Pourpoint (deg. F.)	10	10	10	10	30	30

TABLE 5—VISCOSITIES OF WINTER EXANOL OIL COMPARED TO SAE-10 AND SAE-30 PENNSYLVANIA OILS

	Pennsylvania SAE-10	Winter-grade Exanol oil	Pennsylvania SAE-30
Vis. at —10° F.	27,000	36,000	110,000
Vis. at 0° F.	14,000	20,000	50,000
Vis. at 100° F.	230	351	473
Vis. at 210° F.	48.6	60	63
Vis. at 350° F.	35	36.6	36.4
Kinematic vis. X 100 at 350° F.	2.35	2.95	2.87

The summer grade oil, on the other hand, possesses sufficient viscosity to insure low consumption, but yet at lower temperatures—such as might be encountered in early spring or late fall—is as fluid as many SAE 30 and 40 oils, thereby guaranteeing ease of starting, good pumping, and a plentiful oil

4 QUESTIONS... and 4 Answers

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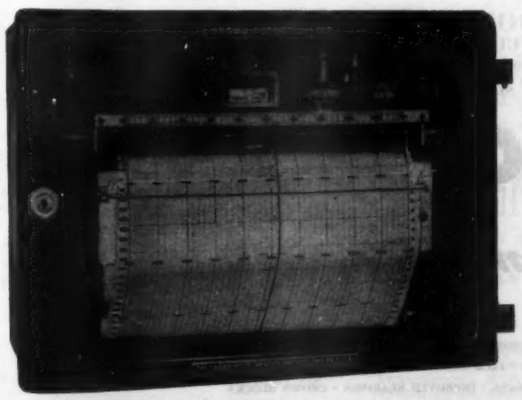
HOW DOES THE MECHANISM RESPOND TO THE GALVANOMETER ?

A. Minute galvanometer pointer deflections are converted into powerful movements of a rugged secondary pointer which controls the positive (pawl type) drive mechanism. This eliminates clutch slippage in recording temperature changes.

The pen can move rapidly in large steps, or take its smallest step of 1/1200th of the chart span with absolute definiteness.



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supply which will adequately lubricate the engine.

A better idea of the comparison of the viscosity-temperature characteristics of these two products as compared to other oils of lower viscosity indices can best be gained from Figures 6 and 7, in which the 210° F. and 100° F. viscosities have been extrapolated on the A.S.T.M. chart to both higher and lower temperatures.

Cold Starting

Numerous break away and cold starting tests have been made on the Exanol and other representative types of commercial motor lubricants at different temperatures. Measurements on the winter oils at —15° F. and 0° F., and on the summer oils at 25° F., were made with a Ford V-8 engine mounted on a

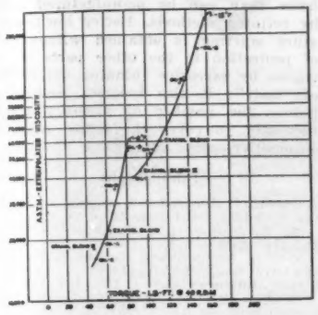

Fig. 8. Low temperature cranking tests at 0° F. and —15° F., 1934 Ford V-8 engine

dynamometer in a well-controlled cold room. For each oil complete cranking speed and frictional torque data were obtained from the initial break away up to cranking speeds of around 150 r.p.m. The results of the tests on the two series of oils are given in Table 6. The torque values used therein have been taken from the cranking speed vs. torque curves for the different oils at a speed of 40 r.p.m., which closely represents the estimated average engine speed required for starting.

The curves in Figures 8 and 9, which have been constructed from the data in Table 6, demonstrate that, as far as cold starting is concerned, the Exanol blended oil behave as would have been predicted from their extrapolated viscosities. They also show another point of especial interest, however. This is that the torque required to turn an engine over at a certain speed is higher for a given viscosity the lower the temperature. In other words, the same series of oils will give separate "viscosity" vs. "torque" curves for each different temperature at which measurements are made, as is illustrated in Figure 8. This behavior is undoubtedly due to changes in engine clearances and other similar factors, brought about by the changed temperature—all of which enter into the final torque measurement.

To further illustrate the normal behavior of the Exanol oils, "ease of starting" tests have been made by still another technique which consists in bringing the engine up to a speed of as near 40 r.p.m. as possible immediately after it starts turning over. In tests on the same Ford V-8 engine at —15° F., the Exanol oil and a 100 viscosity index oil of approximately the same viscosity at that temperature, gave the following results:

Oil—	Visc. at —15°F.	R.p.m.	Observed torque	Torque taken from Fig 8
Oil H	62,000	42	122	115
Exanol blend	60,000	40	116.5	114

Pumping Tests

Pumping tests at low temperatures have also been carried out in a laboratory set-up[2]; and these show that the Exanol blended oils, like other mineral oils, flow or pump in proportion to their extrapolated viscosities at such temperatures—providing, of course, that effects such as channeling, etc., due to solidification of wax are eliminated. Like most mineral lubricants, oil containing Exanol

TABLE 6—COLD CRANKING TESTS—FORD V-8 ENGINE

Winter Oils

Oil—	Viscosity at 100°F.	Viscosity at 210°F.	Viscosity index	Extrapolated viscosities (A.S.T.M.) —15°F.	Extrapolated viscosities (A.S.T.M.) 0°F.	Cranking torque (6 ft.-lb.) at 40 r.p.m. —15°F.	Cranking torque (6 ft.-lb.) at 40 r.p.m. 0°F.
Oil A	265	51	103	52,000	19,000	102	56
Oil B	506	66.2	106	170,000	54,000	152	81
Oil C	243.5	49.5	100	40,000	16,000	86	49
Oil D	366	55.8	97	115,000	35,000	132	68
Exanol blend 1	362	61.2	122	60,000	22,000	114	63
Exanol blend 2	351	61.2	125	43,000	15,000	93	47

Summer Oils

Oil—	Viscosity at 100°F.	Viscosity at 210°F.	Viscosity index	Extrapolated viscosities (A.S.T.M.) +25°F.	Cranking torque (6 ft.-lb.) at 40 r.p.m. +25°F.
Oil E	1,295	105	100	50,000	76
Oil F	965	87.5	97	28,000	63
Oil G	600	69.4	98	16,200	48
Exanol blend	910	101.9	121	17,500	48

TABLE 7—PUMPING TESTS

Oil—	Visc. at 210°F.	Visc. index	Pour-point (°F.)	Test temp. (°F.)	Extrapolated visc. at pumping temp.	Rate of flow (cc. per second) Relief valve at pump	Stations 1	2	3	4
Oil 1	56 2	...	—20	0	50,000	13.2	1.26	2.00	0.34	0.37
Exanol oil	54.7	120	—10	0	15,000	12.1	1.96	4 92	1 60	0 63

are susceptible to the action of Paraflow and, when treated with this product, readily pump without channeling of low temperatures. The low temperature pumping characteristics on the apparatus just mentioned of the Exanol blend and a typical motor lubricant are summarized in Table 7. As will be noted, both oils pumped freely at 0° F.

Consumption Tests

A number of consumption tests have been run on Exanol blends. These have included tests on motor-dynamometer set-ups, using Ford (Model "A"), Chrysler, Chevrolet, and Mack engines, and a series of tests each with a Buick, Chevrolet 6, Ford Model "A," and Ford V-8 car in a controlled temperature room.

Consumption data on the different motor-dynamometer tests using different grades of Exanol blended oils are given in Table 8. These tests were not run primarily to determine oil consumption, but rather were routine runs to observe engine condition and sludging properties. It will be noted in every instance, however, that the consumption of the Exanol oils were lower than those of the usual oils of equivalent or even higher viscosities and flashpoints.

In the Buick tests consumptions were measured at two different speeds: 50 miles per hour and 60 miles per hour. Three oils were employed for these tests, viz., a well-known commercial premium priced Pennsylvania S.A.E. 30 oil, a similar Pennsylvania S.A.E. 10 oil, and an Exanol oil of 60 seconds viscosity at 210° F. and 125 viscosity index. Inspection data on these oils are given in Table 9. Consumption data in terms of quarts per 1,000 miles are given in Table 10. It will be observed that, in spite of the low-

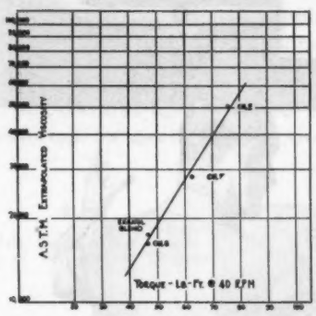

Fig. 9. Low temperature cranking tests at +25° F., 1934 Ford V-8 engine

er viscosity at 210° and lower flashpoint, the Exanol oil showed lower oil consumption at these speeds than did the S.A.E. 30 Pennsylvania oil. This is further illustrated by the curves in Figure 10.

The Ford Model "A" and Chevrolet

TABLE 8—COMPARATIVE OIL CONSUMPTIONS ON MOTOR-DYNAMOMETER RUNS

Motor—	Oil—	Viscosity at 210°F.	Viscosity index	Time of test (hrs.)	Approximate running speed (r.p.m.)	Condition load	Total oil consumption (qts.)
Ford "A"	Coastal distillate	43	13	48	1,500	⅝ throttle	22
Ford	Coastal distillate + Exanol	63	100	48	1,500	⅝ throttle	10
Ford	Hydrogenated distillate + Exanol	55.6	118	48	1,500	⅝ throttle	10
Ford	Pennsylvania S.A.E. 30	61	100	48	1,500	⅝ throttle	12
Chevrolet	Hydrogenated distillate + Exanol	63	125	36	2,000	Road load	1.2
Chevrolet	S.A.E. 30 motor oil	63.6	90	36	2,000	Road load	1.65
Chrysler	Hydrogenated distillate + Exanol	54.2	117	48	2,100	⅝ throttle 42½ m.p.h.	15.4
Chrysler	S.A.E. 20 motor oil	56.5	89	48	2,100	42½ m.p.h.	15.8
Mack	S.A.E. 20 motor oil + Exanol	75	105	84	1,000	⅝ throttle	7.9
Mack	S.A.E. 40 motor oil	73	92	84	1,000	⅝ throttle	10.2

TABLE 12—OIL CONSUMPTION TESTS ON SUMMER OILS—1934 FORD V-8—55 M.P.H.

Oil—	Viscosity at 210°F.	Viscosity index	Flash point	Oil consumption (quarts per 1,000 miles)
Oil O (SAE-30)	64.7	93	435	5.42
Oil P (SAE-50)	87	96	510	4.88
Oil Q (SAE-60)	103.6	96	480	5.12*
Exanol blend	102.2	119	435	3.84
Base stock used in Exanol blend	60.8	103	450	5.88

*It has not been possible to explain the abnormally high consumption on this oil.

TABLE 13—ENGINE-PERFORMANCE AND SLUDGING TESTS

Oil—	Viscosity at 210° F.	Viscosity index	Flash point	De-merit rating	Carbon on: head, block, and Pistons (grams)
Chevrolet 6—48 hours					
Exanol oil (winter grade)	60.2	122	410	1.61	3.67
Pennsylvania SAE-10	47.5	100	415	1.86	4.78
Pennsylvania SAE-20	59	100	455	2.28	5.39
Exanol oil (summer grade)	100.8	119	440	1.70	5.11
White—84 hours					
Pennsylvania SAE-50	85.0	100	470	1.75	86.0
Commercial motor oil SAE-50	87	96	510	1.65	85.6
Exanol oil (summer grade)	100.8	119	440	1.69	68.3

TABLE 14—VISCOSITY STABILITY OF EXANOL OILS

SAE Grade	Number of samples	Total mileage	Mileages of individual tests Minimum	Mileages of individual tests Maximum	Average deviation from original oil Viscosity at 100°F.	Viscosity at 210°F.	Viscosity index
30	97	145,000	273	3,084	—12	—0.6	0
50	49	73,411	980	2,257	— 5	—0.1	—0.1

runs were made in order to determine the performance of the winter blend as compared to other oils. There were five oils in the series of tests run on the

TABLE 9—PHYSICAL PROPERTIES OF OILS USED IN BUICK CONSUMPTION TESTS

	Pennsylvania SAE-10	Exanol oil	Pennsylvania SAE-30
A.P.I. gravity	29.6	30.5	28.4
Flashpoint (deg.F)	410	415	485
Viscosity at 100°F.	198	337	478
Viscosity at 210°F.	46.6	60.3	62
Viscosity index	100	127	100

TABLE 10—BUICK CONSUMPTION TEST OIL CONSUMPTION VS. SPEED

Oil—	Consumption (quarts per 1,000 miles) 50 M.P.H.	60 M.P.H.
Pennsylvania SAE-10	2.00	2.46
Pennsylvania SAE-30	1.78	2.36
Exanol oil	1.40	2.14

TABLE 11—OIL CONSUMPTION TESTS ON WINTER OILS

Oil—	Viscosity at 210°F.	Viscosity Index	Flash point	Oil consumption (qts. per 1,000 miles)
Ford (model "A") —45 M.P.H.				
Oil J (SAE-30)	61.2	107	445	11.95
Exanol blend	60.0	122	415	11.64
Oil K (SAE-30)	67.2	92	470	12.35
Oil L (SAE-40)	74.6	94	485	10.91
Oil M SAE-20W	44.4	30	360	19.96
Chevrolet 6— 40 M.P.H.				
Oil N (SAE-20)	55.8	99	430	1.00
Exanol blend	60	122	415	0.49

Ford at a speed of 45 m.p.h. and two in the tests on the Chevrolet at 40 m.p.h. The data thus obtained are given in Table 11. Similar runs were also made on a Ford V-8 motor at 55 m.p.h. to compare the summer oil with other products. The results of these runs are given in Table 12.

It will be observed that the Exanol oils all showed low consumptions as compared to other oils of the same grade. Such results are probably explainable on the basis that the oils of high viscosity index possess higher viscosities at piston and cylinder-wall temperatures and are, therefore, less subject to pumping past the rings into the combustion chamber than the lubricants of lower viscosity in-

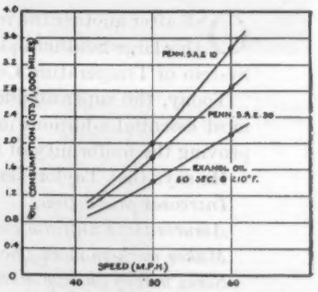

Fig. 10. Oil consumption tests, 1932 Buick 8-87

dex. There are undoubtedly, however, other factors than high-temperature viscosity which may often enter into the problem of oil consumption, although in the cases just cited it would appear to have been the governing factor.

The effect of flashpoint of an oil upon consumption would appear to be of little consequence—provided it is higher than a minimum requirement for the particular type of service, and which extensive tests indicate to be somewhere around 415°F. for light automotive use. The 43 viscosity index at 210° F. Coastal distillate used in the Ford (Model "A") motor test, for instance, (Table 8) had a flashpoint of 325° F. During 48 hours running the flashpoint of the oil was increased to 370° F. (after removal of crank case dilution). The same was true of the run on the same Coastal oil containing Exanol. Consumption, however, was reduced more than one-half on account of the increase in viscosity. Results of a similar nature have been obtained on car tests with oils of flashpoints in the neighborhood of 385° to 395° F. The flashpoints of the used oils after 500 miles to 2,000 miles of running

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were found to be approximately 400° to 405° F., indicating a loss of the more volatile constituents. On the other hand, no increases in the flashpoints of oils with original values of around 410° to 415° F. have been observed under the same conditions of running.

Sludging and Engine Condition

Laboratory engine tests, such as those previously mentioned, have all shown Exanol oils to provide excellent lubrication, and to result in a clean engine condition. In general, it may be stated that the carbon- and sludge-forming properties of Exanol oils are the same as for the base stocks and that, with the proper base oil, superior lubricants may be obtained. Recently-completed tests on the two grades of Exanol oils also tend to substantiate this.

Using a Chevrolet engine operating against a dynamometer, the winter and summer blends were compared with two premium-grade Pennsylvania oils of SAE-10 and -20 classifications on 48-hour runs. Tests on the summer blend were also run on a White truck engine (tests in this case were of 84 hours duration). After the completion of each run the engine was completely torn down and inspected. The performance of the oil was rated on the basis of sludge separation, carbon formation, and the condition of the valves, piston rings, and grooves, and the piston skirts; and has been expressed in the form of a de-merit rating. The lower the de-merit value, the better the performance of the oil.

The results of the series of runs on the two engines are summed up in Table 13. From these data it is evident that the Exanol oils give good performance and show excellent freedom from sludging. These conclusions have been largely substantiated during the past two years, in which more than 60 different passenger cars and light trucks and 12 heavy-duty trucks have been run on several different SAE grades of Exanol oils. More than 600,000 miles, in all, have been run on the tests. Lubrication with these oils has always been found to be excellent.

During the earlier development of Exanol it was sometime observed that a slight loss in the viscosity of the oil occurred during use in a motor. Subsequent studies have shown that this loss results from the actual breakdown of a portion of the Exanol by mechanical action, and that it occurs largely when Exanols of extremely high molecular weight are present. Extensive tests have demonstrated that, by controlling the manufacture of the product, the molecular weight can be so controlled as to give a blend which will show no loss in viscosity—or at least not more than a fraction of a second Saybolt at 210° F. That this observed loss in viscosity is insignificant has been demonstrated by the results of the previously-mentioned car and fleet tests, in which mileages of around 145,000 on the SAE-30 and -50 grades were run with only very slight losses in viscosity being observed (Table 14).

The results of this work have confirmed predictions based on the physical characteristics of Exanol blended oils, in that they have shown that these oils, in comparison to normal oils, give:

1. Lower consumption for comparable ease of starting.
2. Lower carbon- and sludge-forming tendencies.
3. Excellent piston seal and lubrication.

This has led to the commercial production of motor oils by this process. It is believed that Exanol is a new and valuable tool for both the petroleum and automotive industries, in that it provides a means of economically obtaining oils of better temperature-viscosity characteristics than can be manufactured solely by refining methods. Better low-temperature starting is obtained without loss of protection to the other parts of the engine by excessive thinning out or loss of "body"; it also becomes possible to reduce the number of viscosity grades necessary to cover the entire range of automotive-engine lubricants.

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GULF COAST WATER SHIPMENTS IN SEPTEMBER, 1934

Company, terminal—	Crude—Coastwise	Crude—Export	Refined—Coastwise	Refined—Export	Total
Atlantic Pipe Line Co.:					
Atreco	1,573,050.04	109,909.26	17,690.41	.....	1,700,649.71
Texas City	260,946.03	.....	3,768.30	.....	264,714.33
Harbor Island	264,891.24	.....	.....	.....	264,891.24
Gulf Refining Co.:					
Port Arthur	264,460.67	100,197.33	1,707,168.63	48,636.25	2,120,462.88
Humble Oil & Refining Co.:					
Baytown	1,242,429.00	.....	1,807,693.47	590,063.17	3,640,185.64
Harbor Island	1,968,929.00	.....	.....	.....	1,968,929.00
Ingleside	66,811.00	.....	.....	.....	66,811.00
Texas City	214,977.00	.....	.....	.....	214,977.00
Magnolia Petroleum Co.:					
Beaumont	863,262.03	.....	2,072,540.40	.....	2,935,802.43
Pure Oil Co.:					
Smith Bluff	161,915.00	.....	713,642.38	.....	875,557.38
Shell Petroleum Corp.:					
Houston	149,240.50	94,023.76	854,677.94	255,357.25	1,353,299.45
Norco	.....	.....	279,283.10	55,723.45	335,006.55
Standard Oil Co. (La.):					
Baton Rouge	469,306.00	.....	713,362.00	416,476.00	1,599,144.00
Sun Pipe Line Co.:					
Sabine Pass & Sun	1,699,647.00	.....	.....	.....	1,699,647.00
Texas Co.:					
Port Arthur	921,514.00	1,087,909.00	1,320,093.00	496,379.00	4,325,895.00
Miscellaneous:					
Houston	968,677.07	145,766.86	1,232,776.08	671,193.72	3,018,413.73
Total September, 1934	11,090,055.58	1,536,906.21	11,252,199.71	2,533,828.84	26,412,891.34
Total August, 1934	12,539,590.82	1,359,368.35	10,615,588.17	2,261,784.92	26,776,331.25
Difference	1,449,535.24	177,537.86	636,512.54	272,043.92	363,439.91

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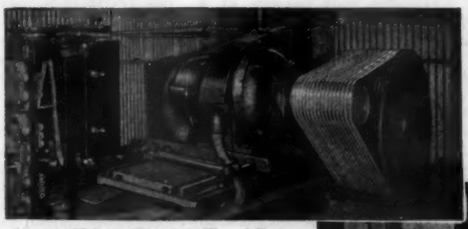
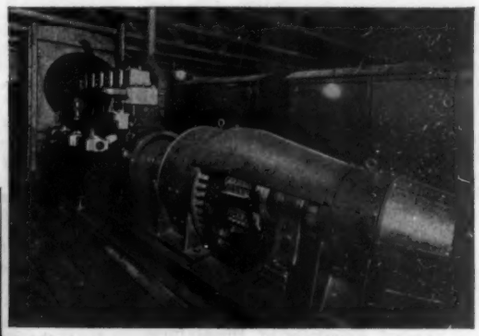


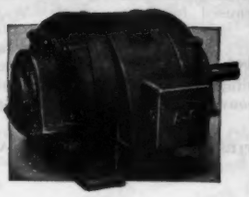
Above: 75-h.p., 900 r.p.m. Wound Rotor Motor and Texrope Single Reduction Unit.

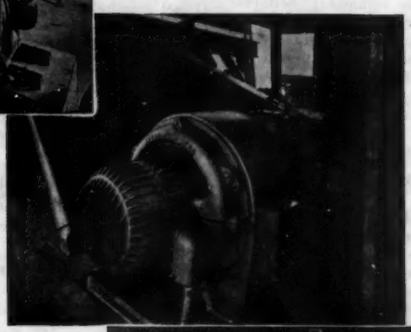
Right: Main Generator and Control Cabinets of D-C Electric Drilling Rig.

Below: General Purpose Squirrel Cage Motors and Texrope Drives operating Slush Pumps.



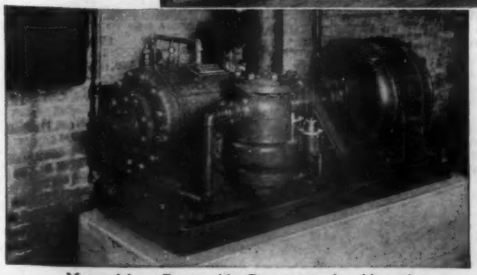
Below: Wound Rotor Motor, Single Reduction Unit and Texrope Drive coupled to Rotary Drilling Rig.





Left: 250/85-h.p. Wound Rotor Motor for Rotary Drilling.

Above: Multi-Rated, Single Speed, Splash-proof Squirrel Cage Pumping Motor.



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A-C OIL FIELD EQUIPMENT

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Generators
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Fuller's Earth Machinery
Power Plant and Electric Distribution Equipment
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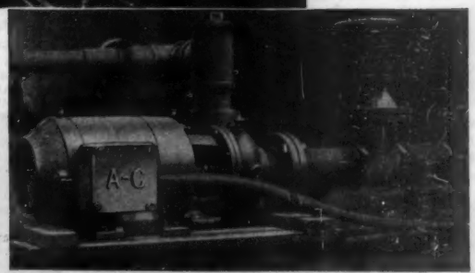
Mining and Metallurgical
Flour Mill and Sawmill
Farm and Road
Timber Preserving
Coal Distillation
Boiler Treatment



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Practical Evaluation of the Ignition Characteristics of Diesel Fuel Oils

By C. C. MOORE, Jr., and G. R. KAYE
Union Oil Co.*

As early as 1907, Rieppel[1] realized that the ignition quality is an important characteristic of Diesel engine fuel. Subsequently, various investigators including Holm,[2] Constam and Schlaepfer,[3] Moore,[4] Tauss and Schulte,[5] Hawkes,[6] Neumann,[7] and Foord,[8] have attempted to develop tests on Diesel fuels that would evaluate this factor, but they were unable to correlate their results with engine performance.

Until recently, the rotational speed of Diesel engines was slow in comparison with the actual delay of ignition; hence ignition lag did not markedly influence engine performance even in the case of fuels which had relatively poor ignition characteristics. However, the recent development of high-speed Diesel engines has made ignition lag a factor of paramount importance in Diesel engine operation, and, consequently, a suitable test to evaluate this factor is needed. When it was realized that more fundamental information was required on the actual behavior of fuels in the combustion chamber, Boerlage and Broeze,[9] LeMesurier and Stansfield,[10] Pope and Murdock,[11] Dicksee,[12] and others began to investigate ignition quality from this standpoint.

Gravity and Viscosity

These investigators succeeded in developing various engine tests for evaluating ignition quality, but their published work does not correlate ignition quality with the physical properties of Diesel fuels. Indeed, it has been commonly believed that the physical properties and ignition characteristics are more or less unrelated. The primary purpose of this article is to show that two of the most commonly determined physical properties of Diesel fuel, viz., gravity and viscosity, will afford a very definite, reliable and accurate indication of ignition quality.

Ignition Quality

For the purpose of this article, ignition may be defined as the spontaneous generation of a flame of sufficient magnitude to insure the complete combustion of the atomized fuel in the combustion chamber. Given the necessary requirements of temperature, pressure fuel atomization, and time, the ease with which a fuel ignites in a Diesel engine is mainly dependent upon its chemical nature. Fuel ignition never occurs simultaneously with the first appearance of the fuel in the combustion chamber, but at some time interval thereafter. This interval is termed the ignition delay or ignition lag, and its duration is a measure of the ignition quality of the fuel oil.

Poor Fuel Ignition

As a result of ignition delay, unburned fuel accumulates in the combustion chamber of the engine during the early stages of each firing cycle. A long ignition delay will cause, therefore, an excessive amount of unburned fuel to accumulate; and when this accumulation is finally ignited, the pressure rise will be considerably in excess of safe or desirable limits and, in addition, the pressure rise will occur very rapidly—producing what is known as a Diesel knock. This may be even more detrimental to good operation in a Diesel engine than is detonation in a gasoline engine. Fuels which have poor ignition quality are, therefore, the most common cause for knocking or rough-running Diesel engines. Ignition quality also markedly affects the ease with which a cold engine can be started. Boerlage and

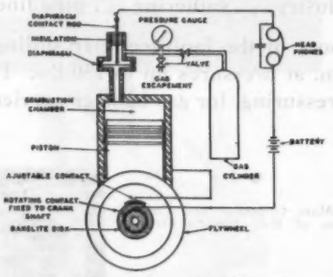

Figure 1. Schematic diagram of electrical circuit apparatus used to determine combustion chamber pressures at any point in Diesel engine cycle

Broeze[13] pointed out that the fuel requirements for good combustion may differ somewhat from the requirements that are prerequisite for good ignition. However, once effective ignition has been obtained, the actual combustion of typical Diesel engine fuels proceeds to completion if the engine is properly adjusted. In fact, it may be said that nearly all difficulties that apparently result from improper fuel combustion, such as knocking, rough running, loss of power, a smoky exhaust, and difficulty in cold starting, are primarily caused by poor fuel ignition.

Delay Number

For a Diesel engine running at constant speed, ignition may be conveniently expressed by the term "delay number," i.e., the number of degrees that the crankshaft rotates in the interval between the beginning of fuel injection and the moment of fuel ignition. A determination of delay number requires the measurement of the exact instant at which fuel injection begins, and then the exact instant at which the ignition of the injected fuel occurs. The apparatus that was used by the research department of the Union Oil Co. of California for making these measurements is illustrated by the schematic diagram shown in Figure 1. It consists essentially of a so-called balanced diaphragm unit, a rotating electrical contact or selector, a telephone head set, and a storage battery. The balanced diaphragm unit consists of a flexible diaphragm which is acted upon by the gas pressure in the combustion chamber. This pressure is opposed by a measured gas pressure from an outside source, such as a nitrogen cylinder. If the combustion chamber pressure exceeds the outside gas pressure, the diaphragm is flexed against an electrical contact which closes that portion of the electrical circuit. By increasing the outside gas pressure gradually, a point is reached when the pressure in the combustion chamber is no longer able to actuate the diaphragm; and when this occurs, the diaphragm contact remains continuously open. The pressure gauge reading at the point of irregular contact is considered equal to the maximum pressure in the combustion chamber of the engine. It is necessary to include in the electrical circuit a rotating contact or selector which is moving in synchronism with the engine crankshaft in order to determine the combustion chamber pressure at any given point in the engine cycle. This selector closes the electrical circuit for a very brief interval by making contact with a stationary arm. The position of this stationary arm can be shifted so that the selector contact will close at any desired crankshaft angle, as indicated by a protractor scale whose zero position corresponds to the top dead center position of the piston. At all other points the selector keeps the electrical circuit continuously open. During the instant that both the selector and diaphragm contact are closed, current will flow through the telephone receivers, producing an audible click. With the stationary contact of the selector set at any given crankshaft angle, the combustion pressure at that point will be equal to the minimum gas pressure which will cause the click to become irregular or just disappear.

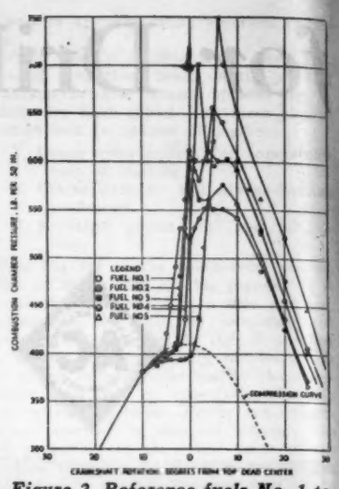

Figure 2. Reference fuels No. 1 to 5 inclusive. Fuel injection, 10 degrees before top dead center. Pressure-time diagrams C.F.R. Diesel engine

The engine that was used for this investigation was the single cylinder variable compression C.F.R. engine developed by the Waukesha Motor Co. This engine was originally designed to determine the knock rating of gasoline, but will operate on a Diesel cycle when the regular gasoline head and piston are replaced by a so-called Diesel conversion unit. The factory designed Diesel test engine was found to be unsatisfactory for continuous operation, and a good deal of modification was required to improve its performance. Better operation resulted when the inlet air was supercharged to a pressure of about 10.5 pounds per square inch gauge, and heated to 260° F. In addition, an air deflector was attached to the inlet valve of the engine to promote turbulence in the combustion chamber, and the head of the piston was altered so that higher compression pressures than were originally possible could be obtained without fuel-spray interference.

Test Conditions

This experimental engine is designed to offer almost unlimited variations in

TABLE 1—THE PROPERTIES OF VARIOUS FOREIGN AND DOMESTIC FUEL OILS AND OTHER OILS OF SIMILAR VISCOSITY

Sample No.	Material and source of crude oil—	Percentage over at 760° F. (pct. by volume)	Conradson carbon residue (pct. by volume)	Gravity (°A.P.I. at 60°F.)	Viscosity (Saybolt Universal seconds at 100°F.)	Viscosity-gravity constant	Delay No. on C.F.R. Diesel engine (deg.)	Cetene No. from Delay No.	Cetene No. from viscosity-gravity constant
1	White medicinal oil, Pennsylvania	100	0.01	37.3	65.4	0.798	3.7+	71.8	72.7
2	Edeleanu-treated spray oil, Los Angeles Basin	100	0.01	24.7	60.1	0.817	4.5+	65.3	65.7
3	Special blend	92	0.01	37.5	42.2	0.818	4.5+	65.3	65.3
4	Gas oil, East Texas	95.5	0.01	33.9	44.8	0.834	5.5—	59.5	60.0
5	Gas oil, Mid-Continent	.....	....	37.8	34.3	0.841	5.5	58.8	57.7
6	Stove distillate, Mid-Continent	100	0.01	36.5	36.0	0.844	5.7	57.4	56.7
7	Gas oil, Kettleman Hills	100	0.01	35.1	37.2	0.842	6.0—	56.2	57.3
8	Stove distillate, Los Angeles Basin	79.5	0.04	36.9	34.3	0.845	6.0	56.5	56.3
9	Gas oil, Los Angeles Basin	91.5	0.07	33.9	40.0	0.846	6.0	56.5	56.0
10	Stove distillate, Los Angeles Basin	.....	....	37.1	34.0	0.848	6.0+	54.9	56.0
11	Bunker Diesel fuel, Persia	73.5	2.90	28.6	67.2	0.852	6.0+	54.9	54.0
12	Bunker Diesel fuel, unknown	.....	....	33.3	39.1	0.846	6.2	54.3	56.0
13	Bunker Diesel fuel, Los Angeles Basin	90	0.07	31.8	43.0	0.848	6.2	54.3	55.3
14	Bunker Diesel fuel, San Joaquin Valley	....	0.05	30.2	42.4	0.857	6.2	54.3	52.9
15	Special blend	88	0.04	31.2	42.5	0.853	6.2+	53.9	53.7
16	Bunker Diesel fuel, Persia	68	2.20	27.4	74.6	0.858	6.5—	53.3	52.7
17	Stove distillate, Mid-Continent	100	0.01	34.5	34.8	0.854	6.5	52.7	55.3
18	Gas oil, Los Angeles Basin	87.5	0.05	27.0	69.0	0.860	6.5+	52.2	51.3
19	Bunker Diesel fuel, San Joaquin Valley	100	0.05	32.6	38.0	0.860	6.7+	51.0	51.7
20	Bunker Diesel fuel, Venezuela	100	0.01	32.2	36.4	0.859	7.0	50.0	51.3
21	Bunker Diesel fuel, Los Angeles Basin	75	1.50	26.5	66.0	0.865	7.2	49.0	49.7
22	Bunker Diesel fuel, Russia	46.5	2.50	23.1	257.5	0.867	7.2	49.0	49.0
23	Bunker Diesel fuel, Mid-Continent	100	0.01	30.6	38.1	0.864	7.2	49.0	50.0
24	Special blend	92.5	0.09	27.1	42.5	0.877	7.7	46.4	45.7
25	Diesel fuel, Mid-Continent	97.5	0.04	26.8	40.0	0.882	8.0	44.8	43.7
26	Gas oil, unknown	.....	....	28.4	36.3	0.881	8.0+	44.3	44.3
27	Diesel fuel, California	.....	....	22.9	60.0	0.892	8.5+	41.8	40.7
28	Bunker Diesel fuel, Aruba	92.5	0.03	23.6	46.8	0.894	9.0	40.0	40.0
29	Bunker Diesel fuel, Borneo	76.0	0.40	21.5	57.5	0.903	9.2	39.2	37.0
30	Gas oil, Venezuela	100	0.03	26.5	35.2	0.897	9.2+	38.6	39.0
31	Special blend	93	1.22	22.0	42.5	0.903	9.7+	36.6	37.0
32	Bunker Diesel fuel, Borneo	65	1.75	18.6	107.0	0.913	10.5	33.8	33.7

*Presented before annual meeting of A.P.I. at Dallas. Author's title, "The Evaluation of the Ignition Characteristics of Diesel Engine Fuel Oils."

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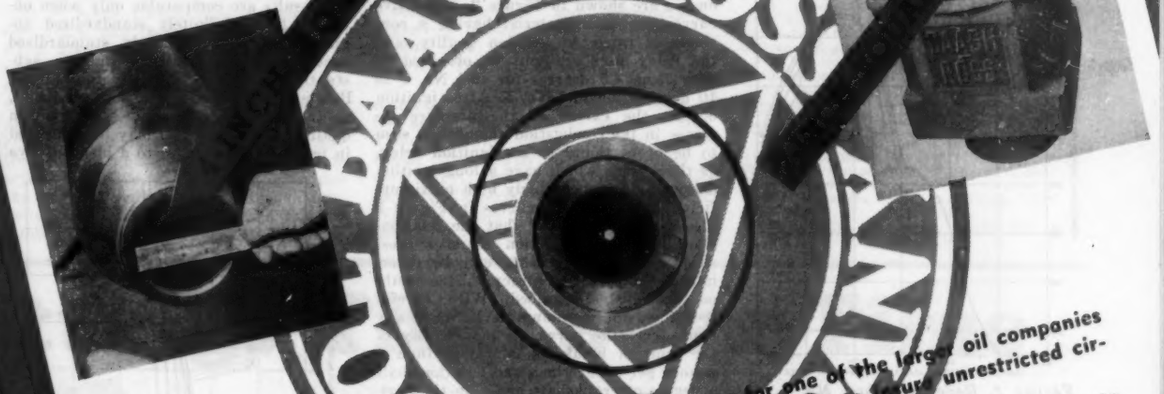

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conditions of operation, and it was necessary to select suitable standard test conditions. The principal criteria in this selection were the reproducibility of the test data, the degree of correlation that could be established between these and similar data obtained from a typical commercial Diesel engine, and the ability of the test engine to operate for a reasonable length of time on a wide variety of test fuels without becoming too seriously fouled with carbon. The test data that are discussed subsequently in this article were obtained with the engine operating under the following standard test conditions:

Engine speed—600 r.p.m.
Oil temperature—130-140° F.
Jacket-water temperature—212° F.
Inlet-air temperature (as measured by the standard C.F.R. motor method thermometer)—250-270° F.
Fuel temperature—80-100° F.
Fuel-line pressure—2,000-3,000 pounds per square inch.
Inlet-air pressure—10.5 pounds per square inch gauge.
Maximum compression pressure (supercharged)—400 pounds per square inch gauge.
Beginning of fuel injection—10° before top dead center.
Fuel feed—Adjusted to give a slightly hazy exhaust.

The electrical device which indicates the beginning of fuel injection is attached

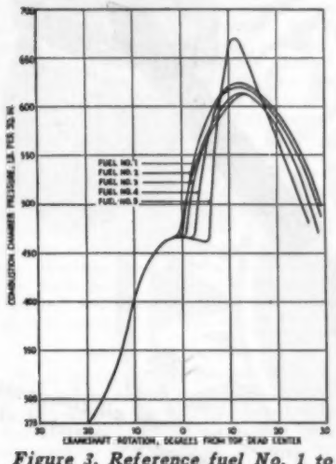

Figure 3. Reference fuel No. 1 to 5 inclusive. Fuel injection, 4 degrees before top dead center. Pressure-time diagrams commercial 75 horsepower Diesel engine

to the pintle-type Bosch injection nozzle. When the nozzle plunger opens to admit fuel into the combustion chamber of the engine, this same movement causes the device to interrupt the primary current in an induction coil, and thereby induces a high-tension discharge which flashes a neon tube located in the periphery of a bakelite disc affixed to the end of the crankshaft. The stroboscopic effect of this flash of light is observed through a slit in the disc, and is located by a fixed protractor scale whose zero position corresponds to top dead center. This device is somewhat imperfect, in as much as its action depends to some extent upon the mechanical adjustment of the electrical contact on the injection nozzle. Furthermore, the flash of the neon tube probably does not exactly correspond to the moment atomized fuel has penetrated far enough into the combustion chamber to make ignition possible. However, with careful technique, the results obtained with this device have shown surprisingly good concordance and reproducibility.

Pressure Time Diagrams

Since it is possible to determine, within 4 or 5 pounds, the pressure of the gases in the combustion chamber at any point in the engine cycle by means of the apparatus described, complete pressure-time diagrams may be constructed for a given fuel which relate the combustion chamber pressures to angularity from the zero or top dead center position of the crankshaft. For our purposes, however, it is unnecessary to construct such a diagram over the entire engine cycle, as it is sufficient to obtain only that portion which includes fuel injection, fuel ignition, maximum firing pressure, and a sufficient section of the curve following the peak pressure to establish the contour. The delay number (number of degrees of crankshaft rotation between beginning of fuel injection and fuel ignition) of the fuel under test can readily be determined, since the pressure time diagram will indicate clearly the position of the sudden pressure rise in the combustion chamber due to the ignition of the fuel. Typical pressure time diagrams obtained in this manner on the modified C.F.R. Diesel engine are shown in Figure 2. These five curves represent material having a considerable range in ignition quality, and the delay numbers will be observed to vary from 4.5 degrees for fuel No. 1 to 10 degrees for fuel No. 5. After ignition occurs, the extent of the pressure increase in the combustion chamber is seen to be proportional to the ignition delay, as those fuels which have a long ignition delay produce exceedingly high maximum firing pressures. The curves in Figure 2 also illustrate the fact that the relationship between combustion chamber pressure and piston position can be determined with great accuracy by the method previously described. With careful technique, the maximum deviation of any point from the curve, in the vicinity of the ignition break, is not more than 5 pounds per square inch and less than half a degree of crankshaft angle on the horizontal scale.

Figure 3 shows the pressure time diagrams of these same five fuels on a 75-horsepower 3-cylinder commercial Diesel engine which was operating under constant conditions at 450 r.p.m. and about three-quarters load. The apparatus necessary to make these determinations was installed on the engine, and the data were then obtained by the same procedure that was used on the experimental Diesel engine in our laboratory.

During the tests on the commercial engine, it was not feasible to determine the actual timing of fuel injection due to the difficulties involved in installing the electrical equipment. The fuel injection timing was, therefore, assumed to be approximately in accordance with the manufacturer's instructions and flywheel marking, and was taken as 4 degrees before top dead center.

Engines Compared

A comparison of Figure 2 with Figure 3 indicates an identical order of rating was obtained with these five fuels on both engines, although it will be observed that their delay numbers in the commercial engine differ by a reasonably constant amount from their C.F.R.-engine delay numbers. It will also be observed that the peak pressure curves in the commercial engine are smooth and rounded, whereas they are sharply peaked and jagged in the modified C.F.R. Diesel engine. These differences can probably be accounted for by the superior design of the combustion chamber of the commercial engine, and by its somewhat slower speed and larger bore. In view of the fact that the experimental engine was not originally designed for Diesel operation, the concordance shown between these two sets of ratings is very satisfactory, and demonstrates that the relative ignition quality ratings obtained on the modified C.F.R. Diesel engine are valid for typical commercial installations. In other words, if the behavior of one engine indicates that fuel "A" is better than fuel "B," but worse than fuel "C," it is very probable that this relative rating will hold true for any typical Diesel engine. This conclusion is in agreement with the work of LeMesurier and Stansfield, Boerlage and Broeze, and others.

It is quite obvious from the foregoing that if the ignition quality of Diesel fuels is expressed in terms of delay number, the results are comparable only when obtained by a definitely standardized engine and under definitely standardized conditions. In order to eliminate substantially the so-called engine factor, Boerlage and Broeze[13] have suggested that, as in the case of gasoline, the ignition quality of a Diesel fuel may be expressed in terms of equivalence to a blend of two

TABLE 2—CETENE NUMBER CORRESPONDING TO GIVEN VISCOSITIES AND GRAVITIES OF DIESEL ENGINE FUEL OIL

Viscosity (Saybolt Universal seconds at 100°F.)	Gravity (°A.P.I. at 60° F.)																
	18	20	22	24	26	27	28	29	30	31	32	33	34	35	36	37	38
34	21	25	29	33	37	39	40	42	44	46	47	49	51	52	54	55	57
35	22	26	30	34	38	40	42	44	46	48	49	51	53	54	56	57	59
36	23	27	31	35	39	41	43	45	47	49	51	52	54	56	58	59	61
37	24	28	32	36	40	42	44	46	48	50	52	53	55	57	59	60	62
38	24	29	33	37	41	43	45	47	49	51	53	54	56	58	60	61	63
39	25	29	33	37	41	43	45	47	49	51	53	55	57	59	61	62	64
40	25	30	34	38	42	44	46	48	50	52	54	56	58	60	62	63	65
42	26	30	35	39	43	45	47	49	51	53	55	57	59	61	63	64	66
44	26	31	35	40	44	46	48	50	52	54	56	58	60	62	64	65	67
46	27	32	36	41	45	47	49	51	53	55	57	59	61	63	65	66	68
48	27	32	36	41	45	47	49	51	53	55	57	59	61	63	65	67	68
50	28	33	37	42	46	48	50	52	54	56	58	60	62	64	66	68	69
60	29	34	39	43	47	50	52	54	56	58	60	62	64	66	68	69	70
80	31	35	40	45	50	52	54	56	58	60	63	65	67	69	71	72	..
100	32	37	42	47	52	54	56	58	60	62	65	67	69	71	..	..	..
150	34	39	44	49	54	56	58	60	63	65	67	69	72	..	..	..	..
200	35	40	45	50	55	58	60	62	65	67	69	71	..	..	..	..	..
300	36	41	47	52	57	60	62	65	67	69	72	..	..	..	..	..	..
400	37	42	48	53	59	61	64	66	68	71	..	..	..	..	..	..	..
500	38	43	49	55	60	63	65	67	70	..	..	..	..	..	..	..	..

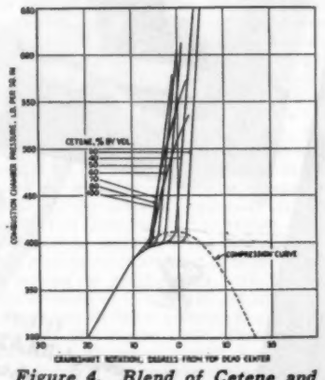

Figure 4. Blend of Cetene and Alpha Methylnaphthalene. Fuel injection 10 degrees before top dead center. Pressure-time diagrams C.F.R. Diesel engine

standard materials—one having good ignition quality, and the other poor ignition quality. Two materials which have properties that are suitable for this purpose are cetene and alpha methylnaphthalene. Cetene is a 16-carbon-atom straight-chain compound having one unsaturated bond and exceptionally good ignition qualities. Alpha methylnaphthalene, on the other hand, ordinarily will not ignite in a Diesel engine.

Correlation of Delay Number

While the alpha methylnaphthalene was readily purchasable, it was found desirable to produce the cetene in our own laboratory by separating it from the products of the destructive distillation, under vacuum, of spermacetti wax. A series of blends of cetene and alpha methylnaphthalene was then made up and rated for ignition quality in terms of delay number by our standard method of test. The pressure time diagrams obtained with these blends are shown in Figure 4. The relationship between cetene number, i.e., the per cent by volume of cetene in a blend and alpha methylnaphthalene, and delay number are shown in Figure 5. Figure 5 is, of course, only valid for test data obtained on this particular modified C.F.R. Diesel engine and by our particular test method. However, since all the Diesel fuels discussed in this article were rated in the same manner, Figure 5 furnishes a convenient means of converting their delay number into cetene number. A Diesel fuel having a delay number between 6.0 and 6.5 degrees is seen to have a cetene number of about 55. This is a typical value for a distilled California Diesel engine fuel oil from Los Angeles Basin crude.

Dumanois[14] demonstrated that the chemical characteristics of Diesel fuels having good ignition quality are the reverse of those characteristics that produce a high octane-value gasoline. Materials containing a large proportion of paraffinic components tend to produce Diesel fuels having excellent ignition qualities and gasolines having poor octane values. Conversely, large proportions of aromatics or cyclic compounds degrade the ignition qualities of Diesel fuels while they improve the knock-rating char-

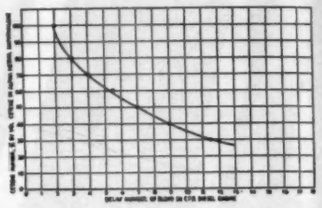

Figure 5. Correlation of delay number on modified C.F.R. Diesel engine with cetene number of fuel

acteristics of gasoline. It might be expected, therefore, that a crude oil that produces gasoline having a relatively poor knock rating would produce a Diesel fuel with good ignition quality, and vice versa. We have accumulated a considerable amount of experimental data which confirm this relationship. We have also observed that a partially-cracked material, such as cycle stock, will invariably show poorer ignition characteristics. This is precisely in accordance with expectations, in as much as cracking reduces the paraffinicity of a material and increases the proportion of aromatics and unsaturated components.

V.-G. C. vs. Ignition Quality

When it was observed that the paraffinicity of a Diesel fuel was so clearly reflected by its ignition quality, it seemed possible to base a fairly close estimate of the ignition quality on a knowledge of the viscosity-gravity characteristics of a Diesel fuel. In 1928 Hill and Coats[15] developed an expression for the paraffinicity of petroleum fractions which they termed the viscosity-gravity constant. Since the viscosity-gravity constant could be readily determined from the viscosity and gravity determinations that are regularly made on Diesel fuels, it was considered desirable to ascertain the relationship between ignition delay and this constant.

In their paper, Hill and Coats derive the equation:

$$G = A + (0.10752 - 0.10A)\ (\log(V - 38))$$

where:

G = gravity, deg. A.P.I. at 60° F.
A = viscosity-gravity constant.
V = Saybolt Universal viscosity, sec. at 100° F.

Our preliminary investigation of the possible relationship between viscosity-gravity constant and ignition quality assumed that the Hill and Coats formula was correct for all viscosities of more than 39 seconds, although these investigators state that the formula becomes increasingly unreliable for viscosities of less than about 50 seconds Saybolt Universal at 100° F. However, in as much as a considerable proportion of Diesel engine fuel oils have viscosities ranging between 34 seconds and 50 seconds, it was ultimately found desirable to develop

a means for obtaining accurate and reliable viscosity-gravity constant values for this low-viscosity range. An extended discussion of this phase of the investigation is beyond the scope of this paper. Suffice it to say that we have derived the equation:

$$G = 1.082A - 0.0887 + (0.776 - 0.72A)(\log\log(KV - 4))$$

where:

G = specific gravity at 60° F.

A = viscosity-gravity constant.

KV = kinematic viscosity in millistokes at 100° F.

This was determined experimentally by establishing the fact that viscosity-gravity constants, when calculated by the Hill and Coats formula, are arithmetically additive and, therefore, are probably fundamentally correct—over the viscosity range of about 50 seconds to 1,000 seconds Saybolt Universal at 100° F. This being so, and knowing that specific gravity is also an additive function, it was possible to postulate that, in so far as viscosity-gravity constants are additive, every variable function appearing in the viscosity-gravity-constant formula is additive. It was then shown experimentally that the viscosity function (log(V—38)), appearing in the Hill and Coats formula, was not additive for viscosities of less than about 50 seconds or more than 1,000 seconds Saybolt Universal at 100° F.; whereas the log log of the kinematic viscosity (expressed as millistokes) minus 4, was found to be an additive viscosity function over the entire viscosity range. We, therefore, modified the Hill and Coats formula by replacing the expression log (V—38) with the expression log log (KV—4), where V is the Saybolt Universal viscosity in seconds at 100° F., and KV is the kinematic viscosity in millistokes at 100° F. The constants of the modified formula were then selected to give precisely the same results as does the Hill and Coats formula over the range of viscosity for which the latter is reliable. This equation, therefore, permits us to obtain viscosity-gravity-constant values which are additive and are, therefore, accurate by inference—over at least the entire working viscosity range of the Saybolt Universal viscosimeter at 100° F. It should be pointed out that subsequent findings may somewhat modify the formula given, but we do not anticipate that such refinements will affect appreciably the data presented here.

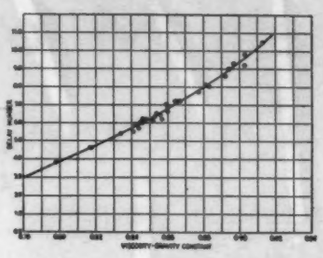

Figure 6. Relationship between viscosity-gravity constant and the ignition quality of Diesel fuel oils expressed as delay number on C.F.R. Diesel engine

Figure 6 shows the experimentally-determined delay numbers of a very wide variety of Diesel engine fuel oils plotted against their respective viscosity-gravity constants calculated by the formula just given. The Diesel fuels used for this correlation include the representative products of many foreign and domestic oil companies, and their physical characteristics are given in Table 1. Figure 6 establishes a significant correlation between the delay number on the modified C.F.R. Diesel engine and the viscosity-gravity constant of Diesel fuels over an exceedingly wide range. It is seen that the ignition quality of a Diesel fuel is a function of its paraffinicity, for which the viscosity-gravity constant is a satisfactory expression. The proof of this relationship is of great value, in as much as it reduces the necessity for engine rating as a means for determining the ignition quality of a Diesel fuel. The relationship between ignition quality and paraffinicity is expressed in its broadest terms in Figure 7. This figure shows the cetene number as a function of viscosity-gravity constant, and was constructed from Figures 5 and 6. It will be observed that the cetene number of a Diesel fuel is related to its viscosity-gravity constant by a first-power equation. This justifies the conclusion that ignition delay is a function of the paraffinicity of the fuel, and independent of viscosity over the usual range.

Cetene No. of Diesel Engine Fuels

In as much as the determination of the viscosity-gravity constant of a Diesel fuel either involves a laborious calculation from an empirical formula, or the use of a special nomographic chart, Table 2 was constructed to eliminate the necessity of the actual determination of this value. Table 2 shows the cetene numbers of Diesel engine fuels directly in terms of their A.P.I. gravity at 60° F. and their Saybolt Universal viscosity at 100° F. We have found that this table gives values which correspond with the most carefully performed engine ratings. The data in Table 2 may be limited in their application to typical petroleum hydrocarbons, and are not necessarily valid for synthetically prepared or "doped" fuels.

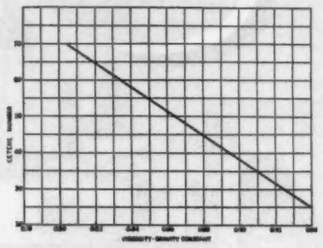

Figure 7. Relationship between cetene number and viscosity-gravity constant of Diesel engine fuel (calculated from data in Figures 5 and 6

Conclusions

To summarize briefly the work presented here, the ignition delay of various Diesel fuels has been correlated with the cetene number (per cent of cetene in a blend of cetene and alpha methylnaphthalene), and also with the viscosity-gravity constant as determined by a modification of the method of Hill and Coats. From these correlations it has been possible to relate cetene number and viscosity-gravity constant, with the result that a very accurate estimation of the ignition characteristics of a Diesel fuel may be obtained simply from the routine determination of its viscosity and gravity, and the use of Table 2.

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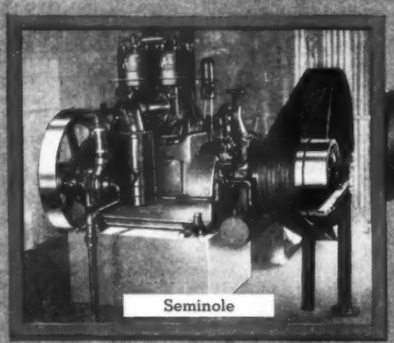
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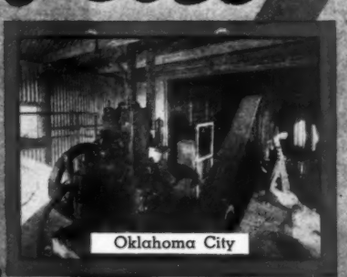
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Committee for Maintaining Viscosity Standard Reports on Past Years' Work and Offers Further Recommendations

By T. G. DELBRIDGE
The Atlantic Refining Co.*

The American Petroleum Institute Committee on Viscosity Standards[1] was created in 1922 for the purpose of co-operating with the National Bureau of Standards in establishing master tubes for the determination of Saybolt Universal and Furol viscosities, in developing directions for the operation of these instruments so that check results might be obtained, and in devising a practical method for correcting the results obtained from any Saybolt Universal or Furol viscometer to give satisfactory agreement between reported efflux times for the same oil by different operators working with different instruments. This committee issued a detailed report in 1924[2] describing the work done in the establishment of standards.

Alpha and Beta Samples

From time to time this same committee has made sure that the standards were being maintained. In 1926 eight samples having a wide range of Saybolt Universal viscosities were distributed to seven co-operating laboratories. The results showed deviations from the average of as high as 4.2 per cent. In 1929 it became evident that there were increasing differences between reports on the same oil from different laboratories. The committee, therefore, reviewed the subject to assist in re-establishing the industry on the basis of the standards developed in 1922-24. For this purpose the committee prepared large samples of two oils, one known as Alpha oil, which was to be used as a secondary reference standard for viscosities at 100° F. Saybolt Universal; and a second known as Beta oil, which was to serve the dual purpose of a 210° F. Saybolt Universal and 122° F. Saybolt Furol standard.

These samples were prepared and stored with every precaution to avoid contamination in viscosity with time. The viscosities of the two oils were determined in the laboratories of the committee members, and the first results showed deviations as high as 1 per cent for individual laboratories when compared to the average value of all members of the committee.

Alpha and Beta Viscosities

It was early recognized that variations between laboratories were just as likely to be due to variables in the accessories to the viscometer proper, and to differences in technique and interpretation of the wording of the standard method resulting from changes in personnel, as to actual differences in standard barrels. The A.S.T.M. standard method D-88 was, therefore, carefully studied, and a list of possible variables was made up—together with suggestions as to how their effect might be minimized. A general meeting was then held in Bayonne, N. J., in March, 1930, at which representatives of six committee members carried out co-operative work—as a result of which the following individual values were obtained on the Alpha oil at 100° F., Saybolt Universal:

Laboratory No.	Corrected efflux time (seconds)	Deviation from average (per cent)
1	294.3	—0.24
2	295.1	+0.03
3	296.7	+0.58
4	294.8	—0.07
5	295.1	+0.03
6	295.0	0.00
7	295.0	0.00
8	294.0	—0.34
Average	295.0	0.16

This brought all of the laboratories into very close agreement, and subsequent work on the Beta oil at 210° F. Universal and 122° F. Furol gave results which were carefully considered by the committee at Atlantic City, in June, 1930. Seven members or their representatives were present, and without dissenting voice it was agreed that the viscosities of the two oils were as follows:

Alpha oil at 100° F. Saybolt Universal = 295.0 sec. ±0.3 per cent.
Beta oil at 210° F. Saybolt Universal = 148.5 sec. ±0.3 per cent.

The Saybolt Furol viscosity of the Beta sample was accepted as:

Beta oil at 122° F. = 116.0 sec. ±0.5 per cent.

The somewhat larger tolerance on values for Furol instruments seemed reasonable, as this instrument has not been as carefully standardized as has the Universal viscometer.

Release of Two Oils

The standard oils were then released to the industry with the values as given above, and to date somewhat more than 200 samples have been distributed. This number included six to foreign countries —England, Germany, South Africa, Canada, Czechoslovakia and the Dutch West Indies being represented. Eighteen major refiners in the United States have checked their instruments against the oils, many of them at annual intervals; and no measurable change in viscosity outside of the above tolerances has been reported. Two U. S. government bureaus and quite a diverse group of consumer industries have also used the oils for calibration standards.

After the release of the Alpha and Beta oils, it was thought advisable to check the results of the above standardization by sending out a sample of unknown viscosity to the committee members and a number of other laboratories which had checked the Alpha standard. This was done in the fall of 1930, and the following results were reported by committee members:

OIL NO. 16,515—SAYBOLT UNIVERSAL AT 100° F.

Laboratory No.	Corrected efflux time (seconds)	Deviation from average (per cent)
1	184.4	—0.32
2	184.8	—0.11
3	184.9	—0.05
4	185.8	+0.43
5	184.8	—0.11
6	185.5	+0.27
7	186.0	+0.54
8	184.0	—0.54
Average	185.0	0.30

The results reported by nine laboratories outside the committee showed an extreme variation of 0.81 per cent and an average deviation of 0.38 per cent from the average value of 185.0 seconds found by the committee.

These excellent results obtained by 17 widely separated laboratories, working under widely different conditions, indicate that the A.S.T.M. method is capable of giving results well within the tolerance of 1 per cent as prescribed in the method.

With the exception of reports from individual members of the committee on the Alpha and Beta oils at approximately yearly intervals, no formal figures or the maintenance of the standard were obtained until December, 1933—at which time an oil designated as A-33 was distributed, and the following results were reported:

OIL A-33—SAYBOLT UNIVERSAL AT 100° F.

Laboratory No.	Corrected efflux time (seconds)	Deviation from average (per cent)
1	235.2	—0.08
2	234.7	—0.29
3	237.5	+0.89
4	235.3	—0.04
5	235.6	+0.08
6	234.7	—0.29
7	234.2	—0.51
8	236.5	+0.61
Average	235.4	0.34

It is to be noted that laboratory No. 3 at the National Bureau of Standards deviates further from the average than any of the others. This was true in the case of Alpha oil in 1929-30, and was sufficiently disturbing to warrant a co-operative check at the bureau to determine the source of the divergence. As a result, a meeting was held in March, 1934, at which representatives of six committee members were present. Some differences in technique, interpretations of the terms of the standard A.S.T.M. method, and equipment were found.

After two days of careful check and rechecking, two contributing sets of factors were definitely established: (1) ambiguities in the description of the A.S.T.M. standard viscosity method; and (2) differences in equipment. Changes in personnel have possibly contributed to the above, particularly the first.

Alpha Values Since 1929

Actual values for the Alpha oil obtained on viscometer tubes which have been maintained as primary standards by committee members since 1929 were as follows:

Laboratory No.	Corrected efflux time 1934	1930
1	294.7	294.3
2	295.2	295.1
3	297.9	296.7
4	295.3	294.8

Ambiguities in the description of the method have been rectified in large part by re-writing the directions. The differences in equipment are being eliminated by more detailed specifications of the bath to be used in standardization work and by establishing a set of new viscometer tubes to serve as primary and secondary standards. The present master tube A-29 has several undesirable features. The proposed new standard tubes have been manufactured from specially hardened steel in the shops of one of the committee members who agreed to furnish four tubes as nearly identical as possible in physical measurements and calibrated to read 295.0 seconds on the Alpha oil at 100° F. when tested under Saybolt Universal conditions.

To insure calibration of all the new tubes under comparable conditions and against the standard value of 295.0 seconds on the Alpha oil at 100° F., a general meeting was held at Bayonne, N. J., June 5-8, inclusive, 1934. Twelve representatives of six committee members were present; and 8 of the 12 took part in the actual physical testing, so that the personal factor in the results obtained was probably well averaged.

The first step was to determine the relationship between the master tubes of three of the committee members, using the Alpha oil. The following results were obtained:

	Laboratory No. 1	3	3
Tube No.	37	476	492
No. of tests	14	12	18
Average viscosity	295.4	296.8	295.5

These values are slightly higher than were obtained in March at Washington,

Electric welders on the firing line of large natural gas pipe line

[1]Personnel of committee:

	Laboratory No.
E. W. Dean, Standard Oil Development Co.	1
T. G. Delbridge, The Atlantic Refining Co. (chairman)	2
O. C. Bridgeman, National Bureau of Standards	3
K. G. Mackenzie, The Texas Co.	4
L. W. Parsons, Tide Water Oil Co.	5
E. B. Phillips, Sinclair Refining Co.	6
J. B. Rather, Socony-Vacuum Corp.	7
J. B. Terry, Standard Oil Co. of California	8
A. E. Pew, Jr., Sun Oil Co.	
H. V. Hume, The Atlantic Refining Co. (secretary)	

[2]Report of the Committee on Viscosity Standards, 1922-24, Amer. Pet. Inst.

*Presented before annual meeting A.P.I. at Dallas.

Author's title, "Report of the Committee on Viscosity Standards."

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which is probably due to the use of a different bath with an open top. The values obtained, however, were within 0.2 per cent of the established viscosity of the Alpha oil. The next step taken was to calibrate six of the new stainless-steel tubes against the committee's standard. This was done by placing tube No. 37 of laboratory No. 1 in the bath with three of the new tubes and determining the viscosity of the Alpha oil in each tube under as nearly comparable conditions as possible. The following results were obtained:

	Tube No.			
	67	65	37	61
No. of tests	6	8	5	11
Average viscosity	295.1	295.4	295.1	295.4

Exactly the same procedure was repeated the next day with another set of three new tubes—retaining No. 37 as a control—with the following results.

	Tube No.			
	72	71	37	56
No. of tests	5	5	7	5
Average viscosity	295.6	295.7	295.7	295.8

The most interesting point in these last two series of results is the apparently inexplicable variation in viscosity of the same oil in the same tube with the same operators and accessories. As far as variations between the six tubes are concerned, as compared to No. 37, they agree within 0.3 sec., which is only 0.1 per cent. The four tubes which appear to be most nearly duplicates are No. 67, 71, 72 and 56. To be able to demonstrate closer agreement between any of the nine tubes tested will require a well-insulated bath—such as that being built at the National Bureau of Standards, more finely calibrated and graduated thermometers, and better stop watches, or some procedure for using more than one watch—to eliminate the known occasional errors in timing.

It is of interest to record the average values of all good determinations on the nine tubes:

Tube No.	Average viscosity
476	295.8
492	295.5
37	295.4
67	295.1
65	295.4
61	295.4
72	295.6
71	295.7
56	295.8
Grand average	295.5

The above results on these new tubes were considered by the committee at Atlantic City in June, 1934, resulting in an agreement that tubes No. 56, 67, 71 and 72 be set aside for the new U. S. standards. After a further exhaustive comparison of the above four tubes in the new standardization bath, with each other and with the present questionable master standard tube and bath, one will be chosen as the new U. S. master standard for Saybolt Universal tubes. This will be set aside at the bureau, and used only once a year for check purposes against the three secondary standards—one to be retained in the possession of the committee chairman and used only for annual comparisons with the master tube, and the other two tubes to be used at the bureau as working standards.

Future Work

Future work of the committee, in addition to the comparative tests just enumerated, will include a careful determination of the relationship between kinematic viscosity and the Saybolt Universal scale, careful study of factors affecting Saybolt Universal viscosities at 210° F. which are not encountered at 100° F., and a survey of the status of Saybolt Furol standards and procedure.

The experience of the committee in this type of standardization work, which has revealed the desirability of amplifying the present A.S.T.M. method D88-33, will be transmitted to Committee D-2 of that organization for its use in rewriting the existing form, so that the industry may have the benefit of the higher accuracy which your committee has been able to attain.

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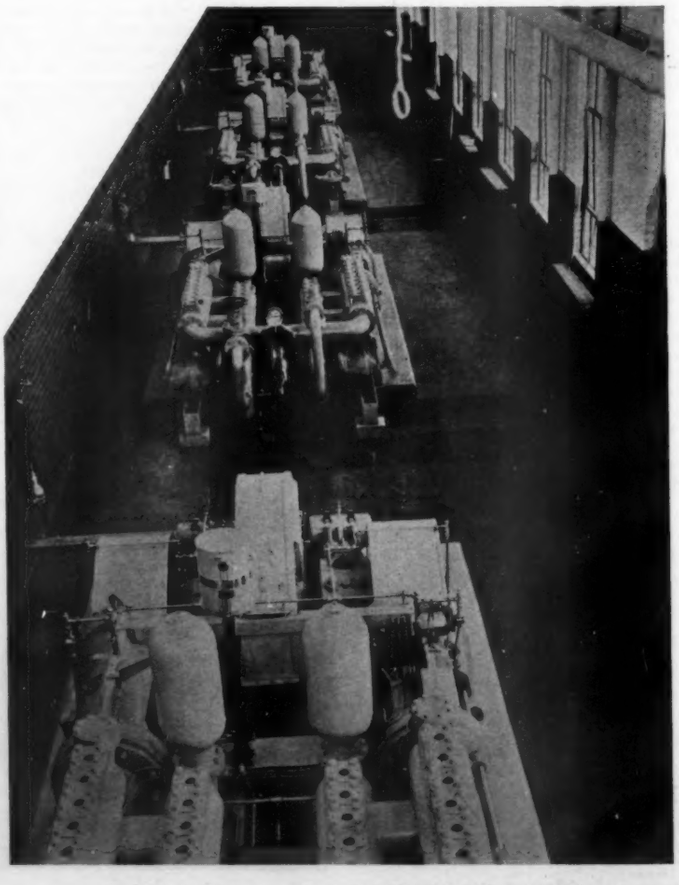


Reciprocating pumps in a gasoline pipe line station

Specific-Gravity Separating System for Maintaining Fuller's Earth Quality

By ASHLEY L. SHEPARD
Sutton, Steele & Steele*

Filter-house operation has long entailed many problems which have defied clear-cut solutions. Everyone in the oil industry has often debated the question when a used fuller's earth should be discarded. A batch of earth, after being used and reburned several times, has been greatly depreciated in decolorizing value; and many batches of such clay, in different stages of degredation, have been stored in separate bins, like the relics which a housekeeper has retired to the attic. Their future usefulness is often of questionable value, but the refiner just won't throw them out. All the questions as to what earth is worth keeping, and what earth should be discarded, can now be easily answered in a mechanical fashion.

Decolorizing

Since it is a known fact that filtering clays depreciate in decolorizing values after each filtering and burning, it is natural that the oil refiner should seek means of better control of burned clays—thus enabling him to keep his clays at a point of higher efficiency for decolorizing purposes.

A great deal of time and money has been spent in research, not only by the refiner, but by the builders of furnaces, to prevent the loss in decolorizing values of clays, which has persisted in the past and still persists.

One of the largest refineries, which collaborated in compiling these data, shows the change in the decolorizing properties of earth after each burn as follows:

No. 1 burned clay shows a decolorizing value of 58 points.

No. 2 burned clay shows a decolorizing value of 40 points.

No. 3 burned clay shows a decolorizing value of 37 points.

No. 4 burned clay shows a decolorizing value of 31 points.

No. 5 burned clay shows a decolorizing value of 27 points.

No. 6 burned clay shows a decolorizing value of 25 points.

No. 7 burned clay shows a decolorizing value of 23 points.

No. 8 burned clay shows a decolorizing value of 21½ points.

No. 9 burned clay shows a decolorizing value of 20 points.

No. 10 burned clay shows a decolorizing value of 18½ points.

These results were obtained by a Lovibond colorimeter, using a 1-inch cell, and standard glasses of the 500 amber series; and in every case the oil had a color of 74 points before filtering.

This particular refining company discards its earth after 10 burnings, as the clay at this point has little or no commercial value.

This refiner has also carefully compiled figures on the values of earth at these different stages of burnings in direct relation to their filtering powers. These figures show that the first burn is worth $30.32 per ton. In arriving at these figures original mine costs were taken plus the shrinkage after burning, and an allowance made for inert materials in new earth which have little or no commercial value. These inert materials can be removed by the process described later on.

Therefore, a No. 1 burned earth is worth $30.32.

Based on its filtering powers plus cost of reburning, etc., a No. 2 clay drops $5.13 per ton, making this grade worth $25.19.

On the same basis of figuring, No. 3 drops $4.79, i.e., No. 3 to $20.40.

No. 4 drops $4.31, thereby dropping value of No. 4 to $16.09.

No. 5 drops $3.58, thereby dropping value of No. 5 to $12.51.

No. 6 drops $2.90, thereby dropping value of No. 6 to $9.61.

No. 7 drops $2.56, thereby dropping value of No. 7 to $7.05.

No. 8 drops $2.38, thereby dropping value of No. 8 to $4.68.

No. 9 drops $2.35, thereby dropping value of No. 9 to $2.32.

No. 10 drops $2.32, thereby dropping value of No. 10 to 0.

These figures are based on the discarding of clay after the ninth burning; and in cases where an earth has been used, or is being used, a greater number of times, the relative proportions vary from the above scale, and are based on a sliding scale using $30.32 for the value of the first ton, ready for filtering work, and graduating to zero as the value of the earth at the discarding point. As just stated, all new earth contains a portion of inert material. This consists principally of one of three commonly known minerals, i.e., barytes, silica, or limestone; or possibly similar formations.

Inert Material

The common cause of the falling off of the decolorizing ability of clays after each burning is the incipient fusion which occurs in the burning of these clays. It is a well known fact that all filtering clays increase in density slightly after each burn. It is also known that the reason for this increase in density is directly due to incipient fusion, and we know by the fusion which occurs that the decolorizing powers of the clays are materially lessened. The answer to this, naturally, would be to remove the material which directly affects the decolorizing ability of clay, and the question which would immediately run through the refiner's mind would be how to remove it. Sutton, Steele & Steele, Inc., builders of dry concentrating tables that operate on an air-flotation principle, depending entirely upon the density of the product for separations, have designed a machine exclusively for the handling of fuller's earth for the sole purpose of removing the inert material accumulating through successive burning. In applying this table to earths already burned, we find the decolorizing ability of fuller's earth has been increased as follows:

As stated before, a No. 1 burned earth shows a decolorizing value of 58 points; by removing 13 per cent of this No. 1 burned earth, we increase the decolorizing value to 62 points. With a removal of 19 per cent inert material from No. 2 burned clay, the decolorizing value becomes 56 points; while the unprocessed earth shows only 48 points with a No. 3 burned clay, 26 per cent of the total amount of earth used was removed, with the decolorizing value of the remaining earth being 51 points as against 37 points on the unprocessed earth. With a No. 4 burned earth, by removing 32 per cent of the total earth, the decolorizing value of the remaining earth runs approximately 46 points, as against the unprocessed earth having a color-removal value of only 31 points. With a No. 5 burned earth, with a total of 36 per cent of the earth removed, we have a decolorizing value on the balance of 39 points, where the original untreated earth showed only the ability to remove 27 points of color. The following successive burns up to 10 show a similar relation to the first five quoted; and we are pointing out the fact, as can be readily seen in Figure 1, that a burned earth processed over the dry concentrating table is naturally improved in its decolorizing value by making this important separation. For example, you will note that a No. 4 burned earth, after processing, has almost the same decolorizing values as a No. 2 unprocessed earth.

Now further to intensify the value of this separation, a series of tests was run under actual production methods—these separations being made as previously described, and an additional amount of No. 1 burned earth was added to replace that which had been removed as inert matter with the following results:

A No. 2 burned earth showed a decolorizing value of 60 points; a No. 3 burned earth 56 points; a No. 4 burned earth 53 points; a No. 5 burned earth 51½ points; a No. 6 burned earth 48 points, etc., to where a No. 10 burned earth still shows a decolorizing ability by this method of 44 points, which is slightly below the values of a No. 2 burned unprocessed earth.

The following averages were obtained as shown in Figure 1: A No. 2 processed earth after treatment gives a better average than a No. 1 burned earth by two points; a No. 3 processed earth shows almost as much a decolorizing value as a No. 1 burned earth; a No. 4 burned earth shows a better decolorizing value than a No. 2 by six points; a No. 5 shows a decolorizing ability better than a No. 2 earth by two and one-half points; a No. 6 processed earth shows an ability to decolorize equal to a No. 2 burned earth; and Nos. 7, 8, 9 and 10, consecutively, show only one point each lower decolorizing value than a No. 2 burned earth.

His own oppinion and that of the cooperating refiner are that best practice will require rejection of from 10 to 15 per cent of the No. 1 clay, followed by a further rejection of possibly 5 per cent after each subsequent burning. The cost of separation should not exceed 10 cents per ton of clay, and it will be seen from that figure that the process is indeed an inexpensive one. The clay-separating tables are sold at a reasonable price, free of royalty charges, and are fully protected by patents.

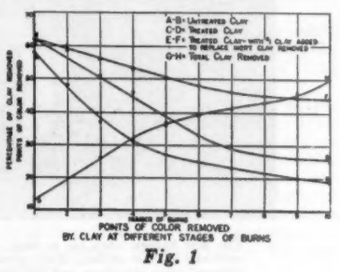

A-B= Untreated Clay
C-D= Treated Clay
E-F= Treated Clay with % Clay Added to Replace Spent Clay Removed
G-H= Total Clay Removed
PERCENTAGE OF CLAY REMOVED (WEIGHT) TO OBTAIN REMOVED
NUMBER OF BURNS
POINTS OF COLOR REMOVED BY CLAY AT DIFFERENT STAGES OF BURNS

Fig. 1

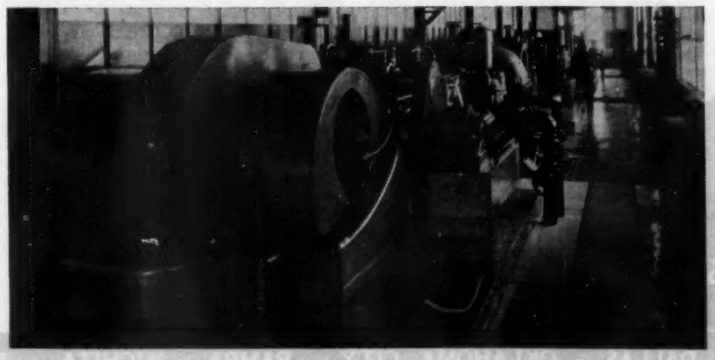
The separating machine is designed to handle efficiently 2 tons of earth per hour at the input end of the machine, which makes a unit a perfect balance, in direct relation with the furnace, in which the earth is burned; most furnaces having a capacity of 24 tons per 12 hours, or 48 tons per day of 24 hours duration.

The amount of clay which it will be necessary to reject after each burning will vary according to the kind of oil with which the clay is used, and according to other factors within control of the individual refiner—particularly the manner and temperature of reburning the clay.

Most refineries carry along several numbers of burned clay, as present methods make it necessary; but by adopting the dry-concentrating and separation method, as described above, it is very easy to cut down the numbers of burned clays to not more than four—thereby saving considerable handling and possible confusion by having so many grades of earth. The separating table also removes, in the same operation, all of the dust caused by natural attrition or abrasion—which, in turn, is caused by constant handling of the clays through the revivifying system; also the removal of the inert particles of these clays, which are extremely hard, naturally lessens the amount of dust produced.

Operating Conditions

These figures were arrived at through the collaboration of one of the largest oil refiners. These tests were made under actual operating conditions, and this method of separation has been adopted in several of their refineries. They consider the treatment mentioned in this article to be the greatest improvement in the handling of filtering clays that has ever been brought before the oil refining industry since the advent of the universal adoption of clays as filtering agents and decolorizers.



Pump side of a modern pipe line pump station

*Presented before annual meeting A.P.I. at Dallas. Author's title, "A Specific-Gravity Separating System for Maintenance of Maximum Quality of Fuller's Earth."

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Outlook of Automotive High Speed Diesels in Heavy Duty Transport

By JOSEPH GESCHELIN
Engineering Editor, Automotive Industries, Philadelphia, Pa.*

Conclusions on Outlook

The outlook for the automotive high-speed Diesel engine in heavy-duty transport may be summarized briefly in the following conclusions:

1. There is an attractive market for Diesel engines on heavy-duty truck, tractor, and industrial equipment used more or less intensively.
2. Specifically, the truck market consists of a slice of the 161,000 vehicles now in service and a certain small percentage of the yearly increment of about 20,000 heavy-duty units.
3. The success of the development depends, to a large extent, upon improvements in the mechanical design of the engine, reduction in maintenance cost—at least to the point where maintenance is no more of a problem than it is with gasoline engines—and also the course of Diesel engine cost.
4. Finally, we may say that the ultimate expansion in this field will depend largely upon the fuel situation. And in this connection I would recommend the following: (a) Development of minimum acceptable fuel specifications. (b) Reasonable economic control of the fuel price. (c) Vigilant study of the tax situation. (d) Development of channels of distribution for Diesel fuel. (e) Closer co-operation between the petroluem industry and Diesel engine manufacturers.

What of the market for the high-speed automotive Diesel engine? What is its significance to the petroleum industry at large?

While it would be most difficult to answer these questions directly and without reservation, this much is certain: that of the power units in the engineering world, the high-speed automotive Diesel engine is most dependent upon its fuel. Not only performance which, obviously, is a direct function of the characteristics of available fuels, but the whole economic future is linked with the availability of its fuel as well as the ultimate trend in fuel cost. The future, therefore, resides to a large extent in the attitude of the petroleum industry.

Specifically, the purpose of this paper is to take up objectively the following considerations which have a direct bearing on automotive-Diesel development in this country:

1. Status of the automotive Diesel engine.
2. Analysis of its present market.
3. Some forecast as to the potential market.
4. Study of the economic factors involved.

Without delving too deeply into past history, it is apparent that while the impetus given to the Diesel has come from many sources, unquestionably the biggest factor has been the adoption of Diesel power by truck and bus operators all over Europe. Few have stopped to reason that an entirely foreign set of economic conditions was responsible for the European development, particularly excessive taxation and high gasoline prices.

Came the well-meaning but misinformed friends of the Diesel engine in this country. Probably all of you remember how several years ago a widely syndicated newspaper columnist told his wondering audience of a new era in transportation with a wonderful power plant that would use fuel just as it came from the ground. One could almost picture large trucks backing up to a hole in the ground and fueling from a pool of crude oil. Then came claims of remarkable performance and seemingly magical economy. To this end comparisons were made using as a basis the wholesale price of fuel oil against gas-station price for gasoline, with no thought whatever to the possibility of a tax on the fuel oil.

As the movement slowly gained momentum, we began to hear from the alarmists. They spoke of the dire calamity arising from a fuel shortage, the possibility of fuel-oil prices sky-rocketing to the point where the Diesel fuel would cost much more than gasoline. And, only a few weeks ago we printed an abstract of a paper published in one of your own petroleum journals in which the author warned Diesel engineers that the fuels that burn most satisfactorily in high-speed engines are likely to be scarce and expensive.

Let me say at this point that no one need become alarmed at the prospect of a great demand for Diesel fuel. In fact, it is really amazing to learn from the statistics given in a later section of this paper that of all the motor vehicles registered in this country, scarcely 1 per cent could be customers for the Diesel at the present time. Is it reasonable to conclude that this small select group could burn enough fuel oil to upset a market serving 24,000,000 vehicles?

In spite of these smoke screens, the automotive Diesel has gained a sound and firm footing in many important quarters. Let us, therefore, look clearly down the middle course, and attempt a perspective of this important development.

It is safe to say the automotive Diesel has inherent advantages in fuel economy that must appeal to operators of certain kinds of equipment. And, for the moment, the Diesel engine enjoys an unparalleled advantage due to a combination of circumstances—an abundant, cheap fuel, not yet penalized by the imposition of a special tax. The next point is that a number of great groups of users in this country are sold on the Diesel engine. These include large truckers, operators of industrial equipment, and the users of farm tractors. These people have been thoroughly convinced by demonstrated economy, and it is reasonable to assume that they will continue to constitute the primary market for the Diesel engine.

Finally, whatever momentum there may be in this direction is greatly intensified by the entry of important engine builders and the acceptance of their product, at least optionally, by the manufacturers of motor trucks, tractors, and industrial units.

With this preliminary introduction, let us look into the development from a purely objective viewpoint.

Why the Diesel Engine?

For a quick picture of inherent economy see Figure 1.

Analysis of published records of fuel economy coming from operators all over the world, and including the experience in this country, indicates that the Diesel is cutting fuel costs between 60 and 80 per cent—the variation being due to the differences in cost of fuel in various localities. Naturally, this extraordinary economy is due to the present low fuel cost as well as the absence of a special fuel tax; it may not last forever, but certainly it is present and may continue for some time to come.

Unquestionably, fuel economy is the chief reason for using the Diesel, and the one which appeals most to the operator. And, ultimately, this economy should be reckoned in terms of the inherent efficiency of the Diesel. Theoretically, the Diesel cycle exceeds the thermal efficiency of the Otto cycle by about 25 per cent; actually, the operating experience all over the world proves that Diesel-equipped vehicles are giving almost twice as much mileage per gallon of fuel, the intrinsic economy on the basis of fuel-tank volume running about 30 to 50 per cent in favor of the Diesel. A reasonable explanation for this is that the Diesel engine has a much flatter fuel-consumption curve than the gasoline engine; and, since many vehicles are operated at part throttle for a great deal of the time, the over-all economy is almost twice as high as the theoretical thermal efficiency may indicate.

More specifically, the operators of heavy-duty equipment, as exemplified by fully-loaded truck-tractor trains, actually show a saving of 3 to 5 cents per mile on their fuel, tax-free.

Another decided advantage, and one which has not been stressed to any extent, is the fact the Diesel power plant runs much cooler, at lower radiator temperatures, due to more efficient burning of the fuel and, consequently, less rejection of waste heat to the water jackets. This is particularly advantageous on tractor and industrial equipment; as it makes possible the use of smaller, lighter, cooling systems, and eliminates the troubles due to over-heating when operating under full-load conditions in a hot, atmosphere or in places where the direct entry of atmospheric air is blocked. It has also proved to be a vital factor in truck operations on the Pacific Coast on runs through the torrid Imperial Valley and over the high ranges of the Rockies.

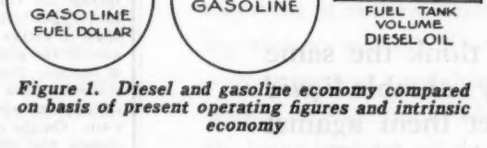

Figure 1. Diesel and gasoline economy compared on basis of present operating figures and intrinsic economy

Still another factor of outstanding importance lies in the demand of our export market. In the past the automotive industry has exported an average of almost 25 per cent of its yearly truck production, which rose to 40 per cent in 1929. With the growing demand for Diesel power in foreign countries, particularly South America, there is grave danger of losing this great market unless American truck manufacturers are in a position to supply Diesel equipment wherever it is specified. With the advent of the production of Diesel engines in this country, our truck manufacturers have been placed in a position to compete on better terms with the European manufacturers—who have been making inroads on our export business. The same is true of our domestic tractor manufacturers.

Scope of Application

1. Industrial units such as tractors, motor-driven railroad equipment, stationary power plants of various description, etc.: Chief advantages of Diesel power for such applications are: fuel economy, cheaper fuel, freedom from fire hazard, better cooling.

2. Marine installations:—The same advantages apply; and, in this field, the Diesel has proved itself over a long period of service.

3. Motor trucks:—The chief advantages are: fuel economy, freedom from fire hazard—particularly important in hauling petroleum products, inflammable liquids in general, explosives, etc.—better torque characteristics in high-gear work. This field seems to offer the most promising future in high production on the heavy-duty units, say from 3½ tons upward.

4. Buses:—The same advantages apply as in the case of the motor truck—except that applications undoubtedly would be restricted not only to larger units, but those operating constantly over long inter-city or interstate routes.

5. Passenger cars:—This high-production field need not be considered in this discussion if, indeed, it should be considered any time in the immediate future.

Limits to Extent of Applications

Despite inherent fuel economy, there are many factors which operate to limit the extent to which Diesel engines may be used. The controlling element, by far, is the added cost of Diesel power which demands the ability to amortize the added cost out of fuel savings, within a short period of time. This is indeed a serious question, and should become more serious in view of the probable shifts in the fuel situation.

Right now the applications in the trucking field are limited to vehicles hauling up to gross weight limits imposed by various states, as for example, 34 tons gross in California. And even in this category, applications are further limited to vehicles covering about 30,000 miles per year.

It is a fact, however, that many trucks cover from 200 to 450 miles a day, and such equipment should justify Diesel power—even in somewhat smaller capacity ratings. Several well-informed observers have even ventured a guess, in recent correspondence, that Diesel power will ultimately extend to vehicles of 14,000-pound to 15,000-pound gross weight used in long-distance hauling.

Despite the present high cost of Diesel power, correctly-chosen applications are claimed to amortize the added cost within periods variously estimated at between three to ten months. Some idea of the magnitude of the added cost may be gained from the examples given below:

1. A large truck manufacturer charges approximately $1,550 more for a truck equipped with a 4-cylinder 90-horsepower engine, and $1,735 more for a 6-cylinder 125-horsepower Diesel.

2. An eastern truck manufacturer charges about $1,000 additional for a heavy-duty chassis equipped with a 6-cylinder 125-horsepower Diesel engine.

3. A mid-western truck manufacturer

*Before annual meeting, A.P.I., Dallas. Author's title, "Outlook for the Automotive High-Speed Diesel Engine in Heavy Duty Transport."

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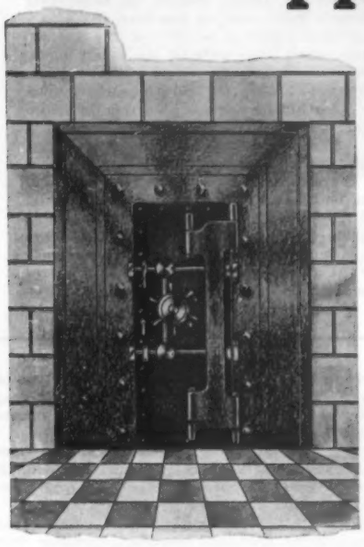

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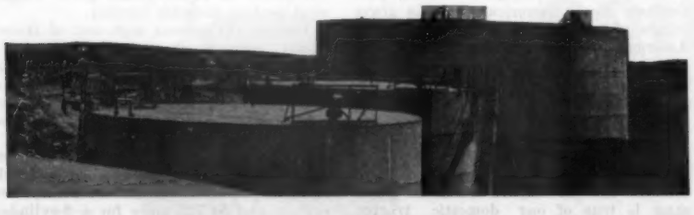


OCECO FITTINGS

charges approximately $800 more for Diesel equipment on 3-ton trucks and $1,500 more for 6-cylinder trucks hauling gross loads from 70,000 pounds to 100,000 pounds.

4. One of the truck manufacturers on the Pacific Coast charges about $1,000 extra on large 10-ton units equipped with 6-cylinder Diesel engines.

5. One prominent engine builder making a line of high-grade heavy-duty gasoline units estimates that their new line of Diesels will probably run 80 per cent higher in price than a gasoline engine of like displacement.

6. Another high-grade heavy-duty engine builder estimates that the list price of his Diesel engines is about double that of a comparable gasoline engine, i.e., $1,800 as compared with $900.

Remember that these added costs are being safely amortized under present operating conditions. Remember, too, that the high cost of Diesel power is due to the newness of the development as well as the relatively small production volume.

This picture, undoubtedly, will change as demand grows; and it has been variously estimated by well-informed Diesel engineers that, with reasonable volume somewhat comparable to that current in gasoline-engine production, the cost of a high-grade Diesel power plant should not be much in excess of 10 or 15 per cent of the cost of comparable gasoline power.

The danger in assuming too wide a market for Diesel application lies in the fact that independent investigations show a rather low average yearly mileage for the gamut of vehicles in all kinds of service. For example, published I.C.C. statistics show that inter-city vehicles on the average cover about 15,000 miles per year. On the other hand, a survey of all classes and all sizes of operations conducted by the National Automobile Chamber of Commerce (now Automobile Manufacturers Association) several years ago, yielded an average figure of only 7,000 miles per year. Roughly, if we assume an average saving of 3 cents per mile for fuel without any other operating expenses in excess of gasoline practice, we should require an average yearly mileage of about 35,000 miles to pay for the added cost. Smaller mileages would require a correspondingly greater period of time for amortizing the additional investment.

Looking at the tractor development, H. H. Howard of the Caterpillar Tractor Co., in a paper entitled "Some Diesel-Tractor Problems," which he presented at the tractor and industrial power equipment meeting of the Society of Automotive Engineers early this year, reports that Diesel power cuts tractor-fuel costs 75 to 80 per cent.

Details of Present Activity

At the present writing the following American engine manufacturers have placed high-speed automotive Diesel engines on the market: Buda Company, American Diesel Engine Co., Cummins Engine Co., Hercules Motors Corp., Waukesha Motor Co., and Sterling Engine Co. I have just learned, too, that another company that has been experimenting for several years expects to be in production on a line of automotive Diesels very soon.

Among the tractor manufacturers we may list the Cleveland Tractor Co., Caterpillar Tractor Co., and International Harvester Co.—the last two building their own Diesel engines.

The following is a list of American motor-truck manufacturers who are among those prepared to supply Diesel equipment when specified: Four Wheel Drive Auto Co., Gramm Motors, Inc., Kenworth Motor Corp., Kleiber Motor Co., Linn Manufacturing Co., Robert Gotfredson Truck Co., Sterling Motor Truck Co., Ward La France Truck Corp., Indiana Division of the White Co., Moreland Motor Truck Corp.

Now just a few notes as to the number of units in service. In the first place, current reports indicate that by the middle part of 1934 more than 90 per cent of all trucks over two tons registered in Germany were Diesel powered. This is a definite trend in all European countries, including England—where over 2,000 Diesel powered vehicles are now in operation.

According to the report by Mr. Howard, mentioned earlier, 90 per cent of the recent demand for heavy-duty tractor equipment in this country was for Diesels, and more than 2,500 caterpillar tractors equipped with this type of power plant were sold during the past 2½ years. International Harvester Co. has sold over 1,000 Diesel units about evenly distributed between Trac-TracTors and power units. This company, too, has found that the demand entirely outstrips their production facilities, and they estimate that for the coming year they will build in the neighborhood of 3,000 units.

Cummins Engine Co. reports that they have records of close to 500 automotive Diesel engines in service at the present time. Waukesha has sold between 1,000 and 1,500 Hesselman engines for use in industrial power units of every description.

TABLE 1—COMPARISON OF GASOLINE AND FUEL OIL PRICES, IN BULK AND RETAIL, FOR VARIOUS LOCALITIES

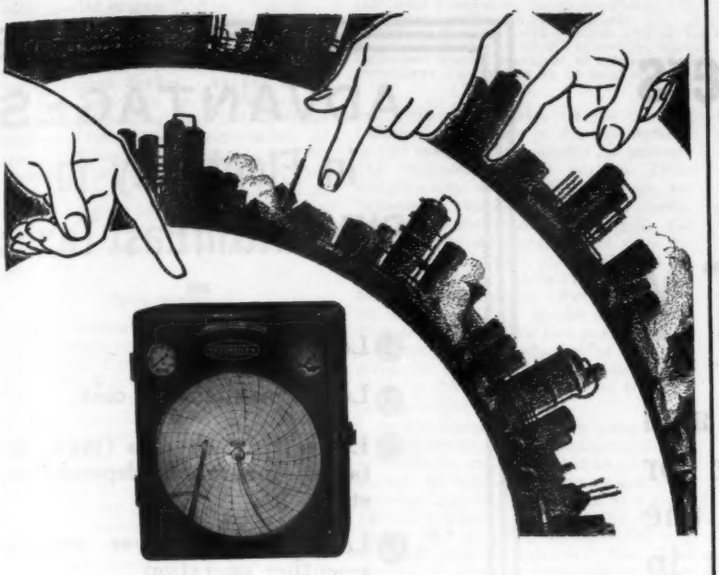
	Tank car prices Sept. 17, 1934 (Cents per gal.)	Service station prices (Cents per gal.)
Oklahoma		
Gasoline	4⅝ to 5	18 (including tax 5 cents)
Fuel oil No. 1	2⅝ to 2⅞	
Diesel (28-30 deg. A.P.I. gravity)	2¼	
Philadelphia		
Gasoline	6¼ to 6⅝	17.5 (includ'g tax 4 cents)
Fuel oil No. 1	... ...	8 (100 gal.)
Diesel (28-30)	4⅝ to 5	
California		
Gasoline	8	18 (including tax 4 cents)
Diesel (27 plus)	2⅝	
Chicago		
Gasoline	4½	16.8 (includ. tax 4 cents)
Fuel oil No. 1	... ...	8.25 (less than 100 gal.) 6.75 (150 gal. or more)
Diesel (28-30)	2½	7.25 (150 gal. or less)

Fuel Economy Figures

In the development of this paper I have collected a great mass of operating figures from many sources. These figures show graphically the tremendous savings that are being made by operators in various parts of the country. Naturally, the figures vary widely due to differences in the type of vehicle, conditions of operation, and in the methods used in computing economy. However, the fact remains that the operators of heavy-duty equipment are saving anywhere from 60 to 80 per cent of the fuel bill, i.e., paying only 20 to 40 per cent of the previous bill for gasoline. I might point out that these comparisons are most significant, since they apply in practically every case to the operation of old equipment, i.e., on trucks which have been in use a number of years and in which the gasoline engine of known performance was replaced by a Diesel.

Maintenance

Maintenance cost in the operation of the American high-speed automotive Diesel engine is a moot question and one which, unfortunately, I am unable to discuss with any degree of confidence—due to the lack of figures and, principally, because of the lack of cumulative experience. On the whole, the few reports that have come to me indicate that maintenance is not a serious problem, although it is quite likely that trouble has been experienced in some instances. Reports from Europe seem to indicate that maintenance cost on the foreign engines



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MONTREAL, CANADA, 620 Cathcart St.	Maurice Peiler, Mgr.
NEW YORK, 19 Rector St.	A. L. Krook, Mgr.
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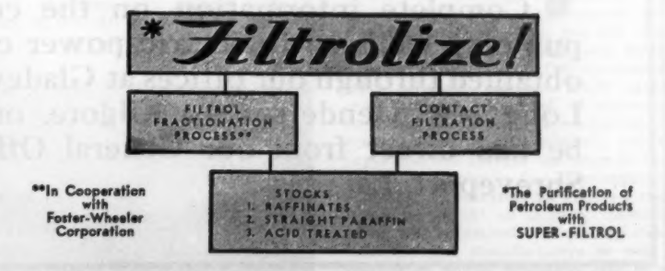

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In this connection it would be quite apropos to mention the remarkable transcontinental run recently completed by the Burlington Zephyr. As you know, this train was built by the Edward G. Budd Manufacturing Co., and equipped with a Winton Diesel eight-in-line of about 700 horsepower, operating at 750 revolutions per minute. I am told that the train covered about 14,000 miles on its barnstorming trip without incident or accident. No part of the injection system needed repair or cleaning during the run.

Total Market

For an estimate of the potential market for Diesel equipment I have used the registration figures published in the Automobile Facts and Figures, 1934 edition, as well as the 1934 statistical issue of Automotive Industries. In 1933 the total motor-truck registration was 3,226,747 units. Assuming that Diesel equipment will be found economical only for vehicles in excess of 2½ tons capacity, we can get a little more closely to the actual market. According to Facts and Figures, the average yearly production of motor trucks of 2½ tons capacity and over was about 5 per cent per year of the total for the last five years. Using this percentage, we can estimate that in 1933 there were approximately 161,000 trucks in operation that might fall in the category of Diesel equipment.

Yearly production of vehicles of 2½ tons and up has run from an all-time high in 1929, of over 54,000, down to 14,523 in 1933.

In addition to the foregoing, there is a total of 45,000 buses in common carrier service in the United States. Of these, 26,314 are in inter-city and intra-state service; but only 5,300 of the latter are in interstate service, according to Bus Transportation.

The foregoing specifies the potential market for the Diesel engine, assuming almost 100 per cent replacement of all vehicles in service. Obviously, this is untenable and we may say that the real market is a certain small percentage of the yearly production of trucks and buses plus a relatively higher volume of replacement business. We may say, in general, that the market for the Diesel narrows down to those units that can yield a sensible economy in operation, consistent with the higher investment charge.

Fuel Situation

As I said earlier, the future of the automotive Diesel seems to be undeniably linked with the availability of its fuel as well as the future course of fuel cost. It seems to me that the situation deserves the co-operation of refiners and the American Petroleum Institute—assuming, of course, that the demand for this type of fuel does not upset the general economic picture of the petroleum industry. It is on this point that we find the greatest controversy, but I have been assured by a number of petroleum technologists that there is nothing at all alarming in the situation that might be created by a moderately increased demand for certain types of fuel oils.

Since operating economy is almost the only consideration, it is axiomatic that the automotive Diesel must use the cheapest, most abundant type of fuel, and one which is readily available in all parts of the country. At present the straight-run fuel oil has been most suitable for this type of service, the No. 1 and No. 2 furnace oils being generally used on truck engines of the high-speed type; No. 3 oil for medium-speed tractor engines. However, due to a lack of understanding of the economic picture, some Diesel engineers have proposed designs which would require fuels meeting unnecessarily rigid specifications. This is a dangerous move, and it is estimated by some petroleum technologists that such fuels may cost more than good gasoline.

What is needed immediately is a thorough investigation of the fuel problem, and some quick action on the part of technical committees in the development of fuel specifications suitable for present-day automotive Diesel engines. These specifications should give minimum requirements consistent with good operation, so as not to affect materially the present price structure. Some work already has been done along this line by the engineering societies; also in the formation of a special voluntary committee headed by T. B. Rendel of the Shell Petroleum Corp. The fact remains, however, that the introduction of new engines, as well as the expansion of the field, is far outstripping the work of these committees.

TABLE 2—SUMMARY OF MOTOR VEHICLE STATISTICS

1933 total registration motor vehicles	23,827,290
1933 total registration motor trucks	3,226,747
Percentage trucks 2½-ton capacity and up (of total)	5
Estimated number of trucks in service, 2½-ton and up	161,000
Estimated yearly increment of trucks, 2½-ton and up	26,000
Percentage 2½-ton and up of total motor vehicles	0.7

At the moment the price situation is most favorable to the automotive-Diesel development, as is evidenced by an examination of Table 1, giving comparative prices of fuel oil and gasoline at a number of different points in the United States. As a matter of fact, the bulk delivered price is even lower than these figures in certain communities—or at least that was the case prior to the application of the petroleum code. However, current correspondence indicates that in California the price of specification fuel already has been increased 50 per cent above the prevailing market price; and, if this is any indication of the trend, it may result in some leveling off between the bulk price of fuel oil and gasoline.

Tax and Distribution

While very little has been said about the possibility of a highway tax on Diesel fuel, the fact is that a tax at least comparable with gasoline practice is inevitable. It is quite fortunate that in the early stages of this infant industry the fuel has been, and still is, tax-free—thereby permitting the amortization of higher-priced equipment. However, the tax is coming; no one knows just when, but it is safe to assume that it will be slapped on just as soon as there are enough vehicles on the road to make it profitable to do so.

Indeed, there is a great element of danger in the situation, unless the future course of the tax policy is carefully watched by all interested organizations. For example, in recent correspondence, I learn from a reliable source that some of the California legislators are considering an excess tax on Diesel fuel oil possibly in the neighborhood of double the gasoline tax—on the theory that this type of equipment will use only half as much fuel by volume and, therefore, should carry double the tax burden to produce revenue equivalent to that expected from the gasoline.

Distribution of Diesel fuel, naturally, is a vital factor in the ultimate development of this form of power. If a common type of fuel-oil product is used, distribution should present no problem whatever, particularly in the case of fleet operations where the fuel is purchased in tank wagon lots. Specification fuel may present a real problem, although even this may not be at all serious in bulk purchases. In thinking about the distribution problem, I have ignored the question of retail service station distribution; while this may be a develpoment in the future, it is hardly a practical consideration at the moment, particularly because the cost of fuel oil purchased in this fashion should be considerably higher than the bulk price, and would make it difficult to amortize the additional cost of Diesel equipment. It is of more than passing interest, however, to note that service station pump distribution has been established at least in one instance, a Diesel pump having been installed in a service station in Los Angeles early this year. We are told that at that time the Diesel fuel was being retailed at 5½ cents per gallon as compared with a contract price of 3 cents per gallon, prevailing in California.

Future Developments in Fuel Situation

In considering the future trend of the fuel picture, I am starting first with the premise that there is an abundance of straightrun fuel oils, and that an appreciable increase in the demand for this type of fuel will not affect the volume of cracking stocks needed for gasoline. This is another controversial element, and one that may be the subject of considerable debate. Some say that any increase in the demand for the straightrun furnace oils will create a shortage, will affect the availability of cracking stocks, and will cause the price of Diesel fuels to increase materially.

Several petroleum technologists with whom I have discussed this matter do not share this point of view. In fact, very recently the chief chemist of one of the large refining plants in the East told me that an increased demand for the straightrun furnace oils would have very little effect, if any, up to the point where the usage of Diesel fuel would amount to about 30 per cent of total gasoline volume. If this be true, then there is very little to worry about; because it would take an extraordinary expansion in the Diesel field before we could hope to approach this break-even point.

If the major premise stated above is tenable, then we may assume that for some time to come there will exist a price differential of perhaps 2 to 3 cents a gallon between gasoline and fuel oil purchased in bulk—with a still greater spread in price as long as fuel oil is tax-free.

Suppose that the demand for Diesel fuel becomes so high that its price comes up to the economic limit; also that the fuel is no longer tax-free, but carries about the same tax as gasoline. It is believed that under these conditions the price of fuel oil still will run from 1 to 2 cents less than the bulk price of gasoline. However, let's assume that the price of the fuel oil is exactly the same as that of gasoline. What will be the result?

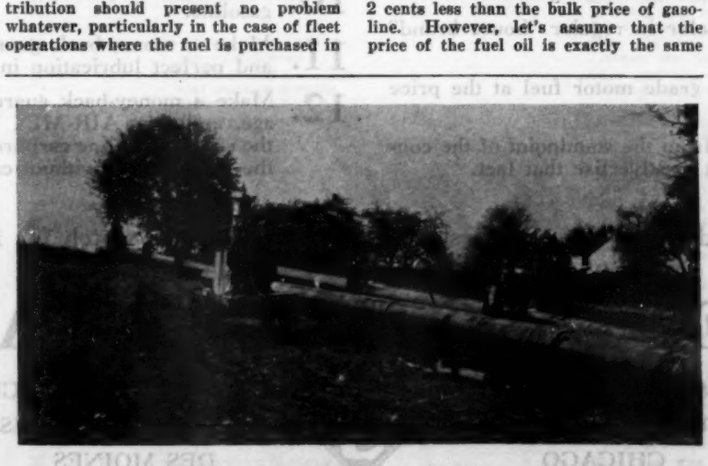
Under these conditions, the Diesel would rest on its own inherent economy—which on the average amounts to 30 to 50 per cent saving in fuel by volume. But since that time is a long way off and implies great expansion and a great shift from gasoline equipment to Diesel, it is reasonable to assume that, if and when, we have reached this phase of Diesel development, there will be a much greater volume of Diesel production—quite comparable, in fact, with present gasoline-engine production. And, under those circumstances it is estimated by Diesel experts that the price of the Diesel power plant will drop down within 10 to 15 per cent over that of good high-grade gasoline engines. So, in the dim future, if we see the likelihood of fuel oil at the same price as gasoline, the Diesel engine still will have a great advantage in fuel economy, and still will offer an attractive investment for certain operating conditions.

Competitive Factors

In considering any new economic development, it is well to take into account competitive factors that may have some effect on its future prospects. A number of such elements are present. First is the continual improvement in the gasoline engine; but while this is a factor, it is hardly likely that the gasoline engine can possibly approach the inherent efficiency of the Diesel engine. Another element is the development of special devices for burning cheap, heavy fuels in gasoline engines. Then there is the competition from a new source—the availability of new fuels, such as butane and propane, which may be burned in the gasoline engine.

We must reckon also with special engine equipment, such as the Waukesha-Hesselman engine—of which over a thousand have been sold for industrial purposes in this country, and which is designed to burn the cheapest grades of fuel oil. Again, during the course of the last year or so, several new systems have been developed for converting gasoline egnines into solid-injection engines of moderate compression ratio operating with spark ignition. The special systems supplied by the Atlas Imperial Diesel Engine Co. and Guiberson are examples of this type.

How far these competitive elements will encroach upon the expansion of the Diesel engine is a matter for conjecture.



Large capacity natural gas line being welded by acetylene method

Active Preparations for Houston Oil Show

With over one-half of the exhibit space already contracted for, detailed plans are being made for the Sixth Annual Oil Equipment and Engineering Exposition which will be held in Convention Hall at Houston, Tex., from April 8 to 13 inclusive.

A special section for scientific and engineering developments will be set aside for independent engineers, as well as engineering associations and technical organizations including universities. This section will be devoted to research developments in repressuring, gas lift, flooding, seismograph and geophysical service, geological work, oil well fire shooting and other scientific services. These various exhibitors will be invited to participate in order to advance the scientific development in the oil industry, and the exposition will furnish the space to these exhibitors absolutely free. The exposition will act as a laboratory as well as a clearing house for the oil industry. These exhibits will be limited to the above classifications, and manufacturers as well as established service companies will be excluded from this division.

The regular commercial exhibits will include all types of equipment for drilling, production, refining and transportation. A large percentage of the equipment will be in operation, and a tract of land adjacent to the Convention Hall will be devoted to the demonstration of moving machinery and to the display of large equipment.

Proof of Skelly Leadership in Refining

Air View of the Skelly Refinery at El Dorado, Kansas

SKELLY was the FIRST Refiner to

1. Offer a "Better than New Navy Gasoline" when "New Navy" was the accepted standard for motor fuel.
2. Seal and tag its drums of motor oil with a tag bearing guaranteed specifications.
3. Manufacture and market a satisfactory all-petroleum, gum-free, high anti-knock gasoline.
4. Originate orange color in regular "house brand" gasoline.
5. Offer its premium grade motor fuel at the price of regular.
6. Road test gasoline from the standpoint of the consumer and the first to advertise that fact.
7. Manufacture and advertise the combination of high test and high anti-knock in one gasoline.
8. Tailor-make gasoline and motor oil to fit varying weather and geographic conditions.
9. Road test all 53 gasolines sold in the middle west and advertise the facts revealed.
10. Make a money-back guarantee on quick starting in gasoline.
11. Make a money-back guarantee on easy starting and perfect lubrication in motor oil.
12. Make a money-back guarantee on gasoline mileage, and new AIR-MIX Tailor-making, to keep the air and gasoline carburetor mixture at 7600-to-1 the year around without carburetor adjustment.

And Skelly soon will establish another FIRST—watch for it.

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MINNEAPOLIS
DES MOINES

Commercial Situation of Automotive Extreme Pressure Lubricants

By H. C. MOUGEY
General Motors Corp.*

Extreme pressure lubricants or "E. P. Lubricants," as they are commonly called, are lubricants which under certain operating conditions will permit greater loads or speeds than can be carried with ordinary mineral oil or similar viscosity. By this definition castor oil, lard oil, and other saponifiable oils would be classified as E. P. lubricants, but when we refer to E. P. lubricants we ordinarily think of load carrying ability superior to what we can obtain with saponifiable oils. We recognize two general classes:

1. Powerful E. P. lubricants capable of lubricating hypoid gears when operated under very severe conditions of load and speed.

2. Mild E. P. lubricants, not capable of lubricating hypoid gears under these severe conditions, but capable of lubricating gears such as spiral bevel, etc., when they are operated under certain load and speed conditions that would cause scuffing if ordinary mineral oils were used.

This classification should not be taken as being too definite. Some hypoid gears, depending upon design or service requirements or both, may be lubricated satisfactorily with mild E. P. lubricants or even with straight mineral oils, and some spiral bevel gears may require mild E. P. lubricants or even the more powerful E. P. lubricants.

Transmission and rear axle lubricants, up to the present time, have largely consisted of high viscosity oils with or without the addition of small amounts of soap to decrease leakage, etc., and as such were quite simple from the standpoints of both the oil and automotive industries. However, during the last few years many changes have been taking place. Engines have been made so that they are much "smoother" and capable of much higher speed and power output. Automobiles have been improved in their riding properties, and there has been an enormous increase in good roads. Automobile bodies, for safety and appearance, have been made lower. The net result is that the size of the gears has been reduced and the speed and power output have been increased to such an extent that E. P. lubricants which are more powerful in their load carrying ability are coming into more general use.

React With Bearing Metal

Several years ago it was believed that thin films or layers of certain types of lubricants were much more tenacious, tougher or harder than thin films of other lubricants, but it soon became apparent that the load carrying ability of an E. P. lubricant depends not on the film strength of the layer of the lubricant between the bearing surface but upon the properties of the film that is formed by some material in the lubricant reacting with the bearing metal. In other words, an E. P. lubricant does not contain a material that when spread out in a thin film carries the load, but instead it contains a material which may react with the bearing metal and thus form the load carrying film on the surface of the bearing.

Unless an opportunity is given for the material in the lubricant to react with the bearing metal and thus produce the film forming material on the surface of the bearing, an E. P. lubricant may be found to be little, if any, better than ordinary mineral oil in load carrying ability. This explains why different testing machines appear to give such disagreeing results, and why an E. P. lubricant that is very powerful under some conditions and with a certain bearing material may fail to show these properties under other conditions or when used with a bearing of different chemical composition. This means that an E. P. lubricant does not have a definite "film strength," but the expression "film strength" may be cery convenient in describing the performance of a lubricant on a definite testing machine when operated under specific testing conditions.

Many types of laboratory testing machines[1,2,3,4,5,6] have been proposed for evaluating or classifying extreme-pressure lubricants. All of these testing machines will show differences in the load-carrying ability of different lubricants; but, unless the testing machine will rate the lubricants in the same relative order of merit as the lubricants are rated in service, the data obtained are not only worthless, but misleading. A laboratory testing machine cannot operate under the same conditions of pressure, rubbing velocity, temperature, etc. as are encountered under all actual service conditions. Any attempt to duplicate exact service conditions results in a design which is an exact duplicate of the service unit. Consequently, for each laboratory testing machine a set of operating conditions must be selected which will rate the lubricants in the same order of merit as is indicated by actual service. A testing machine which has been standardized in terms of the primary service data becomes a secondary standard for determining uniformity in production and for evaluating new lubricants with respect to extreme-pressure characteristics.

Much of the research work on extreme-pressure lubricants appears to be directed toward the development of lubricants capable of lubricating a particular laboratory testing machine, and fails to recognize the real problem of lubricating gears and other production parts under actual service conditions.

Service Requirements Differ

Expressions such as "film strength, in pounds per square inch," or "load in pounds per linear inch," may be very convenient in reporting tests on specific testing machines, or in comparing different gear designs, but they must be used with great caution when trying to predict the requirements in service from the results on a testing machine. The maximum tooth pressure in an ordinary spiral bevel gear rear axle may be as high as 350,000 to 400,000 pounds per square inch. Since the actual rubbing speed between the

*Presented before annual meeting of A.P.I. in Dallas. Author's title: "Commercial Situation of Automotive Extreme Pressure Lubricants."

[1]H. C. Mougey and J. O. Almen, "Extreme-Pressure Lubricants." Proc., twelfth annual meeting, Amer. Pet. Inst., Sect. 3, p. 76.

[2]H. C. Mougey, "The Significant Properties of Automotive Lubricants," Detroit regional meeting, Am. Soc. Testing Materials, March 19, 1930, Symposium on Developments in Automotive Materials, p. 127.

[3]C. M. Larson, "Discussion on Extreme-Pressure Lubricants," Proc., twelfth annual meeting, Amer. Pet. Inst., Sect. 3, p. 83.

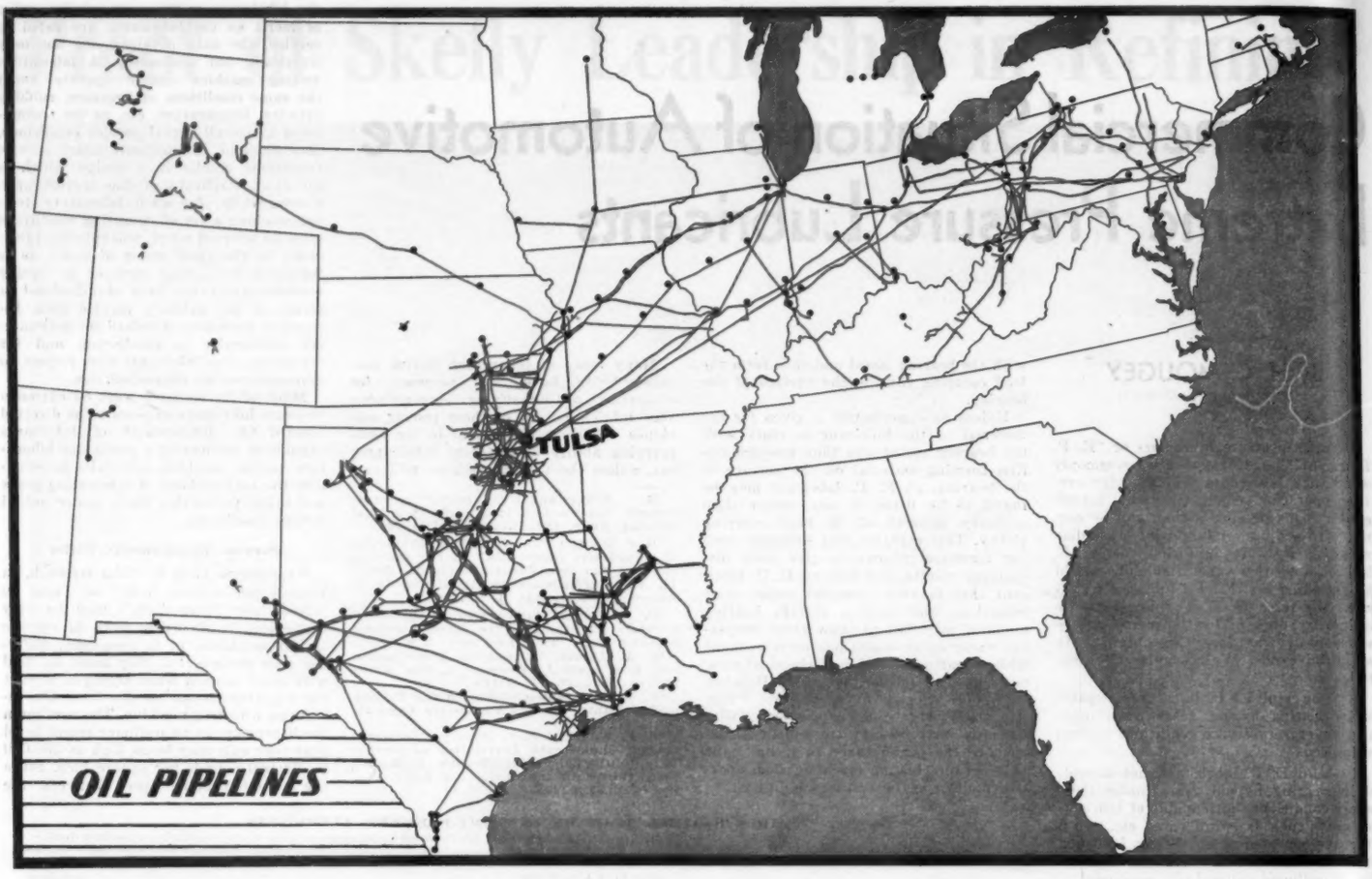
[4]C. M. Larson, "Classifying Transmission and Rear Axle Lubricants," J. Soc. Automotive Eng., 28, 51 (1931).

[5]E. Wooler, "Observations on the Testing of Lubricants," J. Soc. Automotive Eng., 28, 53 (1931).

[6]H. R. Wolf and H. C. Mougey, "Extreme-Pressure Lubricants, Correlation of Service Data With Laboratory Testing Methods." Proc., thirteenth annual meeting, Amer. Pet. Inst., Sect. 3, p. 118.

TABLE 1—ALMEN TESTS ON EXTREME-PRESSURE LUBRICANTS

Test No.	Lubricant No.	Type of lubricant	Standard Almen test Torque @ 30 lbs. loading lb.-ft.	Static tests on Almen machine with 30 pounds on loading device: Condition of test pin at time of static torque test	Initial torque lb.-ft.	Torque in following tests lb.-ft.
			10		10	10
1	1	Engine oil	Seized @ 6-lb. loading	New pin and bushing	75	65-75
2	2	Bright stock S.A.E. 70	Seized @ 8-lb. loading	New pin and bushing	80	75-85
3	3	Lard oil	Seized @ 14-lb. loading	New pin and bushing	75	50-65
4	4	Castor oil	Seized @ 18-lb. loading	New pin and bushing	80	52-62
5	5	Carbon tetrachloride	23	New pin and bushing	95	90-94
6	6	Bright stock + 10% carbon tetrachloride	25	New pin and bushing	77	50-60
7	7	Mineral oil + 20% commercial sulphur-chloride saponifiable oil base	32	New pin and bushing	80	45-55
8	8	Lead soap lubricant	Seized @ 10 lb. loading	New pin and bushing	85	55-80
9	9	"Lead soap plus sulphur" lubricant	35	New pin and bushing	80	57-68
10	10	Sulphur-mineral oil	61	New pin and bushing	80	53-58
11	11	Sulphur saponifiable	34	New pin and bushing	78	52-60
12	12	Glycerin	Seized @ 8-lb. loading	New pin and bushing	85	81-88
13	13	Sulphur-chloride saponifiable oil	19	New pin and bushing	53	40-45
14	..	No lubricant	..	New pin and bushing washed with ether and alcohol and dried. Tested dry	120	120-145
15	2	Bright stock S.A.E. 70	..	After pin was run-in by adding 2 pounds every 30 seconds to a final load of 12 pounds. (After making static test, pin seized in standard Almen test at 16 pounds)	65	50-60
16	4	Castor oil	..	After pin was run-in by standard Almen test to 12 pounds	90	70-75
17	6	Bright stock + 10%	..	After pin was run-in by rotating bearing approx. 4 r.p.m. for 30 sec. at 30-pound load	57	56-58
18	6	Bright stock + 10% carbon tetrachloride	..	After pin was run-in by standard Almen test to 16-pound load	51	40-50
19	7	Mineral oil + 20% commercial sulphur-chloride saponifiable oil base	..	After pin was run-in by standard Almen test to 16-pound load	55	50-55
20	8	Lead soap lubricant	..	After pin was run-in with a few drops of lubricant No. 8 on the pin to 8 pounds, and then lubricant No. 8 added to oil cup. (After making static test, pin seized in standard Almen test at 14 pounds)	60	50-58
21	9	"Lead soap + sulphur" lubricant	..	After pin was run-in by standard Almen test to 30 pounds	45	42-47
22	10	Sulphur-mineral oil	..	After pin was run-in by standard Almen test to 30 pounds	130	125-140
23	11	Sulphur-saponifiable	..	After pin was run-in by standard Almen test to 20 pounds	48	50-51
24	5	Carbon tetrachloride	..	After pin was run-in by adding 2 pounds per second to 30 pounds total	30	28-34
25	..	Bright stock (lub. No. 2) with pin and bushing from test No. 22	..	Pin and bushings from test No. 22 were washed with benzol and bright stock (lubricant No. 2) was added to the oil cup. (After static test was made, the load was reduced to 12 pounds and an attempt was made to run-in the pin and bushing at 12 pounds. Seizure occurred in a very few seconds)	60	60-65
26	13	Sulphur-chloride saponifiable oil	..	After pin was run-in by standard Almen test to 30 pounds	26	26-27



$8,000,000 IN OIL

Closed and purchased by Tulsa concerns

That leasing activity in Oklahoma is in the "big business" class, today, is indicated by the fact that in a 6-week period in September and October deals on oil properties totalling approximately $8,000,000 were closed between various Tulsa oil concerns.

It is significant that most of this business concerned non-producing oil lands in newly discovered pools in Oklahoma, which were purchased for immediate development.

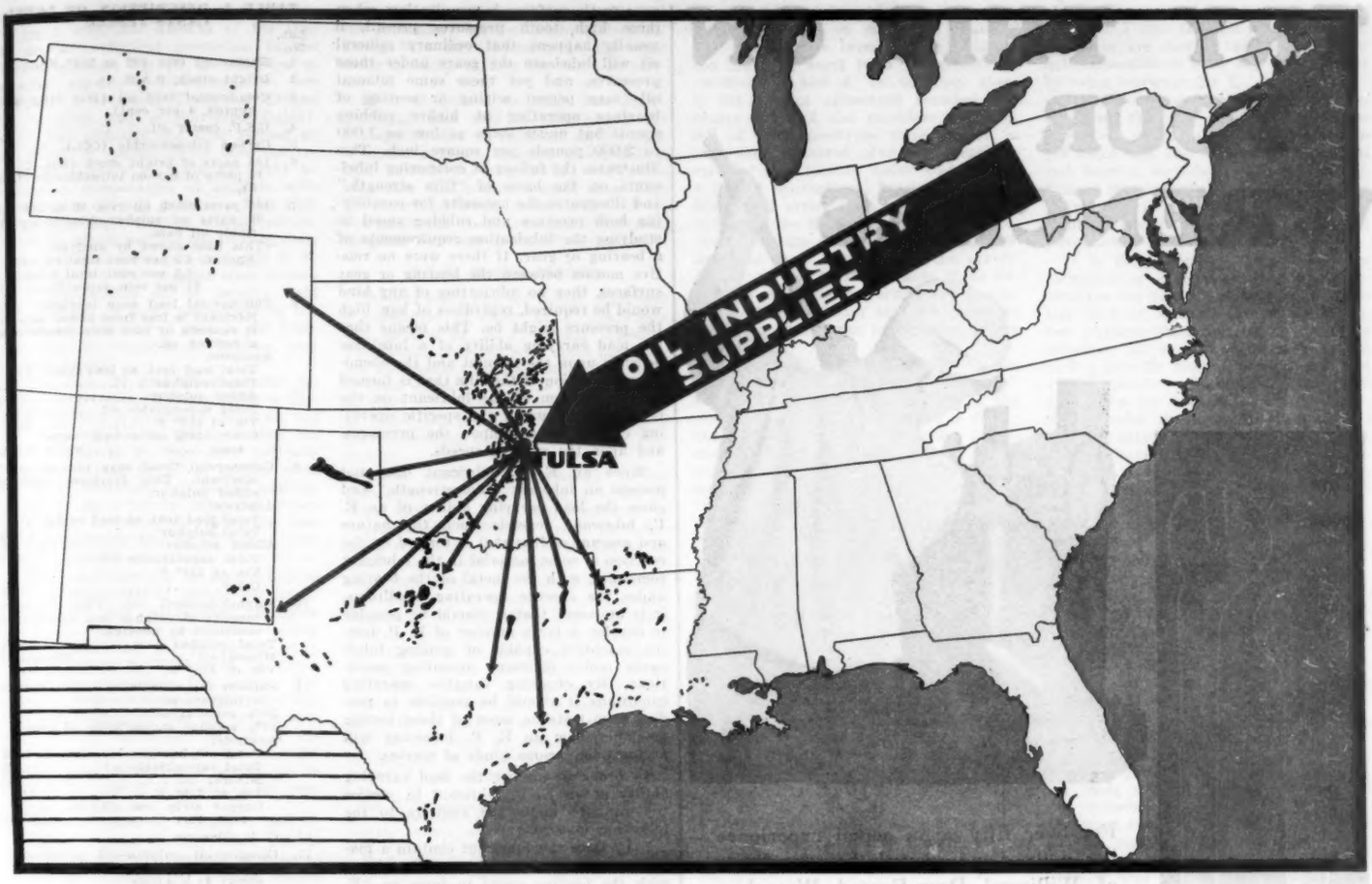
No other major oil area in the world at this time shows leasing activity comparable to that now in progress in Oklahoma, with Tulsa as headquarters.

Akron is unquestionably the Rubber Capital, Detroit the Automobile Capital, Pittsburgh the Steel Capital. No less certainly does Tulsa stand out as the World's *Oil* Capital!

Tulsa's leadership begins with oil PRODUCTION. Located at the center of the Mid-Continent oil area, which produces 63% of the nation's oil, Tulsa has become the primary headquarters for production operations throughout this area. Her strategic location has brought to Tulsa the headquarters offices of 44 major oil companies—more than are found in all other oil centers of the Southwest combined—and approximately 550 smaller oil companies. These companies control a large proportion of the oil production in the Mid-Continent, and much of the production in the Gulf Coast, Rocky Mountain and other areas. Tulsa's leadership as oil production headquarters is increasing with every year, for every year additional oil companies move their headquarters offices to Tulsa.

Tulsa's central location with regard to oil production, dating back to 1907, when Oklahoma first took the lead among

TULSA INVITES THE A. P. I. CONVENTION FOR 1936



DEALS IN 6 WEEKS

mainly in non-producing oil properties

the states in volume of production,—has brought about the condition pictured by the first map herewith. This map shows Tulsa as the hub of the nation's oil pipe line and refining systems, representing an investment of billions of dollars. Much of the nation's pipe line and refining activity is controlled from executive offices in Tulsa.

A recent check also disclosed the fact that no less than two-thirds of the nation's production of natural gasoline is controlled from Tulsa, the output of plants as far distant as West Virginia and Pennsylvania being marketed by Tulsa companies.

The natural result of the foregoing facts is pictured by Map Number 2. Production, pipe line, natural gasoline and refining companies located in Tulsa purchase, in a normal year, supplies and equipment totalling $400,000,000.

This has made Tulsa the world's primary distributing point for oil field, pipe line and refining equipment. Not only is the purchasing power concentrated in Tulsa, but, as the map indicates, Tulsa is geographically located at the gateway to the oil fields of the Mid-Continent, Gulf Coast and Rocky Mountain areas, few important fields in these areas being much more than an overnight rail trip from Tulsa.

These impressive facts have brought many equipment factories, branch offices and warehouses to Tulsa. The oil equipment manufacturer who is not represented here is overlooking a major sales opportunity. For information about the Tulsa market for oil equipment address the Tulsa Chamber of Commerce.

TULSA

Oil Capital of the World

TRY THIS ON YOUR WRENCHES

For over fifty years actual experience has daily demonstrated the superiority of Williams' Drop-Forged Wrenches. Severe tests, likewise, prove the exceptional strength of these dependable tools. Above is an actual, unretouched photograph of a Williams' Wrench stripping the threads on a one-half inch U. S. Standard bolt without any injury whatever to the wrench.

If you want strength combined with perfect balance, insist upon Williams' Wrenches. Ask your distributor.

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WILLIAMS' DROP-FORGED WRENCHES
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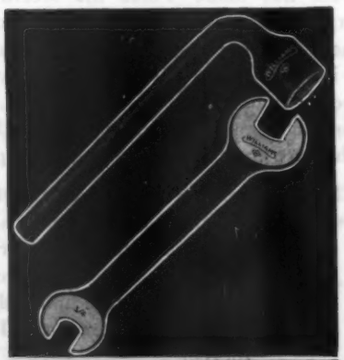

gear teeth surfaces is usually low when these high tooth pressures prevail, it usually happens that ordinary mineral oil will lubricate the gears under these pressures, and yet these same mineral oils may permit seizing or scoring of bearings operating at higher rubbing speeds but under loads as low as 1,000 to 2,000 pounds per square inch. This illustrates the fallacy of comparing lubricants on the basis of "film strength," and illustrates the necessity for considering both pressure and rubbing speed in studying the lubrication requirements of a bearing or gear. If there were no relative motion between the bearing or gear surfaces, then no lubrication of any kind would be required, regardless of how high the pressure might be. This means that the load carrying ability of a lubricant depends upon the amount and the chemical composition of the film that is formed by the reaction of the lubricant on the bearing metal under the specific operating conditions, and upon the pressures, and upon the rubbing speeds.

Since an E. P. lubricant does not possess an inherent "film strength," and since the load carrying ability of an E. P. lubricant depends upon the nature and amount of film that is formed by the reaction of some material in the lubricant combining with the metal of the bearing under the specific operating conditions, it is apparent that it should be possible to develop a large number of E. P. testing machines capable of grading lubricants under different operating conditions. By choosing suitable operating conditions it should be possible to predict from tests on most of these testing machines how an E. P. lubricant will perform in various kinds of service.

In order to predict the load carrying ability of an E. P. lubricant in service we want to know the answers to the following questions:

(a) Does the lubricant contain a material capable of reacting or combining with the bearing metal to form an "E. P." film?

(b) Will this be formed at the temperature in the bearing that results from the particular load and speed at which the bearing is to be operated?

(c) Will the film be formed in sufficient amount under the operating conditions to produce a film of sufficient load carrying ability?

As an illustration of how information obtainable from a test machine can be used to study film forming characteristics of lubricants, the results of a number of tests on different lubricants are given in Tables 1, 2 and 3. These lubricants are tested on the Almen testing machine. This machine is described in detail in a paper on "Extreme-Pressure Lubricants" presented at the November, 1932, meeting of the American Petroleum Institute.[6] Briefly, it consists of a test pin or journal made of one-quarter inch diameter drill rod which can be rotated in a one-half inch long split bushing with provisions for loading the bearing thus formed by clamping together the two halves of the split bushing. Provision is also made to measure the torque required to rotate the journal in the loaded bearing.

Almen Test

The standard method of making a test on the Almen machine consists in immersing the test pin and bushings in the lubricant to be tested and then rotating the test pin at 600 r.p.m. The load which clamps the two halves of the split bushing is increased at the rate of 2 pounds added every 10 seconds. A record is made of the torque required to rotate the pin at each load increment and the test is completed either when 30 pounds have been added to the loading device or when seizure occurs, whichever happens first. The construction of the machine is such that each 2-pound weight added to the loading device increases the load on the pin 125 pounds. The torque is read in tenths of a pound-foot. However, as pointed out above, these figures should not be used to calculate the pounds pressure for a gear or bearing in actual service.

TABLE 2—DESCRIPTION OF LUBRICANTS TESTED

Lub. No.

1. Engine oil (vis. 132 at 130° F.).
2. Bright stock, S.A.E. 70.
3. Commercial lard oil (free fatty acid approx. 4 per cent).
4. U.S.P. castor oil.
5. Carbon tetrachloride (CCl_4).
6. 100 parts of bright stock (Lub. 2). 10 parts of carbon tetrachloride (Lub. 5).
7. 100 parts black oil (vis. 90 at 210° F.) 20 parts of sulphur-chloride-saponifiable oil base.
   (This base shows by analysis
   Approx. 4.5 per cent total chlorine
   4.5 per cent total sulphur
   91 per cent saponifiable oil)
8. Commercial lead soap lubricant. This lubricant is free from added sulphur. It consists of lead soap dissolved in a refined oil.
   Analysis:
   Total lead (cal. as lead oxide) 4.8%
   Total sulphur 0.74%
   Added sulphur ..... None
   Total saponifiable oil 12.2%
   Vis. at 210° F. 107
   Color (50% oil + 50% kerosene ....No. 8 N.P.A.
9. Commercial "lead soap plus sulphur" lubricant. This lubricant contains added sulphur.
   Analysis:
   Total lead (cal. as lead oxide) 6.5%
   Total sulphur 1.94%
   Added sulphur .....Present
   Total saponifiable oil 16.0
   Vis. at 210° F. .....92.
   Color .....Black
10. Sulphur-mineral oil. This lubricant consists of sulphur and mineral oil combined by cooking.
    Total sulphur 2.44%
    Mineral oil .....Remainder
    Vis. at 210° F. 160
11. Sulphur-saponifiable lubricant. This is a mixture of
    50% mineral oil.
    50% sulphur saponifiable oil base.
    Analysis:
    Total sulphur 5.4%
    Total saponifiable oil 46.2%
    Mineral oil ....Remainder
    Vis. at 210° F. 198
    Copper strip test (3 hrs. at 200° F.)) .....Negative
12. C. P. Glycerin.
13. Commercial sulphur-chloride-saponifiable oil lubricant. (This lubricant shows by analysis
    Approx. 4.5% total chlorine
    4.5% total sulphur
    91% saponifiable oil.)
    This lubricant is the base used in preparing lubricant No. 7.

In order to make a "static test" with the Almen machine, the pin and bushings are put in the oil cup and the lubricant added just as if a regular Almen test was to be made. With no load on the loading pan, the pin is rotated a few revolutions by turning the driving wheel by hand. This insures a distribution of lubricant in the bearing. Thirty pounds are then added to the loading pan, and force is then very slowly applied by hand to the driving wheel to cause the pin to rotate a very few degrees. The highest torque that can be applied without causing the pin to rotate the slightest perceptible amount is taken as the "static torque."

An examination of the data in Tables 1, 2 and 3, will show how these tests give information concerning the performance of E. P. lubricants. In Table 1 the initial static tests on lubricants 1 to 12 inclusive are all high, but the temperature developed by making the first static test may or may not be sufficient to cause the torque readings to the following tests to be much lower.

Tests Nos. 15 and 16 (bright stock and castor oil) show that although the pin and bushings are made smoother and work hardened by running the machine at low load, we were unable to get a very great reduction in static friction or to make much of a gain in load carrying ability by running in with either bright stock or castor oil. However, tests Nos. 17 to 26 inclusive show that if a lubricant and bearing combination can show extreme pressure properties it is possible to develop the E. P. film by running in the bearing under the proper conditions in the presence of the lubricant.

Tests Nos. 20 and 21 (lead soap without and with added sulphur), show that although it may be possible to develop the desired E. P. film using a straight "lead soap-mineral oil" lubricant with-

out added sulphur, it is very difficult to get a sufficient amount of the film to provide sufficient protection to the bearing surface, but by the addition of a small amount of added sulphur, this difficulty is overcome. Tests Nos. 22 and 23 (sulphur and sulphur-saponifiable), show that although the film formed as the result of sulphur alone does not reduce the friction as much as might be desired, a combination of sulphur with saponifiable oil may produce a film with very much lower friction characteristics. However, experience has shown that since saponifiable oil alone has only mild E. P. properties, and since sulphur when cooked with saponifiable oil is usually held rather firmly, a large percentage of the sulphur-saponifiable oil base in the lubricant may be required to produce very marked results.

Tests Nos. 24 and 25 show the decrease in friction resulting from a film produced from a chlorine compound, but they also emphasize the fact that the effect of an E. P. film does not continue for a long period of service after the E. P. lubricant is removed and replaced by an ordinary lubricant. These two tests, however, do illustrate how E. P. lubricants may be of use in running-in gears or bearings.

These tests are only to illustrate film forming properties. It should not be inferred that any particular lubricants mentioned in these tests are recommended, since all the properties of a lubricant must be considered in determining its suitability for service. For example, carbon tetrachloride, under certain test conditions, was one of the best film forming materials, but it is apparent that on account of its volatility and corrosive properties it would not be suitable for use in a lubricant for rear axle lubrication.

The data given in Tables 1 and 3, or the data given by any other laboratory testing machine, cannot be used to predict performance in service, unless it is definitely known by actual service tests with a variety of lubricants that the laboratory testing machine does actually rate the lubricants in the same order of merit as they are rated in service.

If it is desired to make one E. P. lubricant that will be satisfactory for a large number of types of service such as steering gears, elevator gears, rolling mill equipment, automobile rear axles, etc., then the lubricant must show high E. P. values when tested under all of the particular conditions that correspond to these different types of service.

S.A.E. Testing Machine

Several years ago the S.A.E. organized a committee to study E. P. lubricants and develop an E. P. testing machine. The results obtained with these machines did not check with each other, and none of them appeared to grade the lubricants in their true order of merit when used as lubricants for hypoid or spiral bevel gears operating under very extreme conditions.

These machines were tested at the Bureau of Standards using a series of nine lubricants that were selected to illustrate the different types of lubricants recognized at that time. Papers on these tests were presented before the American Petroleum Institute in 1932[7] and before the Society of Automotive Engineers in 1933.[8] The nine lubricants used in these tests and their rating on the different machines, as reported in the paper before the S.A.E., are shown in Tables 4 and 5. The load carrying ability of the lubricants is expressed in the ratio of load at seizure in comparison to the load at seizure of mineral oil. It will be noted that test machines 1 and 2 and machines 3 and 4 give results that are in fairly close agreement, but the results on machines 1 and 2 rate some of the lubricants in a different order of merit from the results on machines 3 and 4. In addition, there is not perfect agreement between machines 1 and 2 and machines 3 and 4. All of these machines were similar in that they consisted of a steel shaft or cylinder that rotated under load against a flat or conventional bearing. The rubbing speed varied from 6 to 400 feet per minute. Some of the machines used hardened bearings and journals, while unhardened steel was used in the others. As pointed out by the authors, these differences in design, materials, and operating conditions should and did result in rating the lubricants in different orders of merit.

A more critical examination of the data in Table 5 will show that the difference in load carrying ability of the several lubricants is essentially a difference in the rate of film formation. Lubricants 3 and 4 (lead soap without added sulphur) show strong E. P. properties on machines 1 and 2 but they are not rated any better than straight mineral oil on machines 3 and 4. It is evident that the bearing materials and the temperature resulting from the operating conditions in machines 1 and 2 are such that the E. P. film is formed before the load reaches a high enough value to cause seizure, but that in machines 3 and 4 the conditions are such that the E. P. film is so slow in forming that seizure occurs at loads no higher than those mineral oil will carry.

The sulphur-chloride lubricants (Nos. 6 and 7) furnish another example of the effect of machine design and operating conditions on the rate of film formation. These two lubricants are identical with the exception that No. 6 contains a higher percentage of sulphur chloride base than No. 7, and as a result No. 6 carries more load than No. 7 on machine No. 1.

On machines 3 and 4, however, the rate of film formation is so high with lubricant No. 7 that the full capacity of the machines are reached and consequently it is impossible to show any improvement by using lubricant No. 6.

In a like manner the differences between all the other lubricants tested on these four machines may be explained on the basis that the differences in journal and bearing materials, rubbing velocity, rate at which load is applied and other differences in operating technique, all result in a difference in the rate of film formation.

It is this difference in rate of film formation on a given machine which determines the point of seizure or the relative load at seizure. Consequently, unless physical limitations of the machine interfere, all machines can be operated with a specific bearing combination and under specific operating conditions so as to give the same rate of film formation. Under these conditions lubricants would be rated in the same order of merit on all laboratory testing machines. Further, if the conditions selected give the same relative rate of film formation as is experienced in a specific service application then any of the proposed machines could be used for evaluating extreme-pressure lubricants for this particular service application.

In order to overcome the physical limitations of some testing machines and to obtain a standard machine which will permit rating the lubricants in the same order of merit as they are shown to have by performance in service, the Bureau of Standards designed a new E. P. testing machine for the S.A.E. committee. Fundamentally, this machine consists of two hardened steel cylinders which are rotated against each other under varying loads with provisions made so that one cylinder rotates much slower than the other, thus producing a sliding action. Several machines of this general design have been made, in each machine an attempt was made to correct details in which the previous model was not satis-

[7] O. C. Bridgeman, "The Problem of Extreme-Pressure Lubricants," Proc., thirteenth annual meeting, Amer. Pet. Inst., Sect. 3, p. 114 (1932).

[8] S. A. McKee, E. A. Harrington and T. R. McKee, "Load Carrying Capacity of Extreme-Pressure Lubricants." J.A.S.E. Vol. 32, 6, p. 217 (June, 1933).

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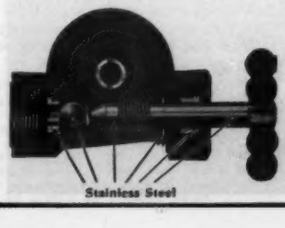

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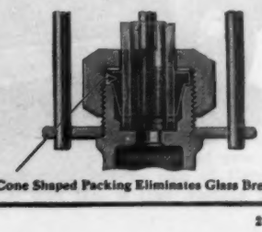

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factory. This work is progressing very rapidly and it is my belief that the S.A.E. lubricants E. P. testing machine will be available for use within the very near future.

Demand in Automotive Use

We have already seen how present conditions make E. P. lubricants absolutely necessary for certain designs. These designs may require the power E. P. lubricants or the conditions may be such that the mild E. P. lubricants have enough "load carrying ability." Where E. P. lubricants are required there is no choice in regard to whether or not they are used.

In some cases an E. P. lubricant may be required before the gears or bearings have been well run in and ordinary lubricants may then be satisfactory. Under certain conditions E. P. lubricants may be very desirable for running-in gears or bearings, even when the running in could be done with straight mineral oil. The saving in time and the greater factor of safety in running in are both important.

Where E. P. lubricants are not absolutely required they may still be desirable on account of their greater factor of safety, provided they do not have disadvantages that outweigh their advantages. Among the disadvantages are:

1. Greater cost.
2. Possibility of abrasion or corrosion from certain types of E. P. lubricants.
3. Possibility of the lubricant thickening (or oxidizing).

The objection due to the greater cost of E. P. lubricants is usually more important from the standpoint of the automobile manufacturer than the car owner. The manufacturer uses large amounts of lubricants and a very small difference in price makes a large difference in the total cost of lubricants. In the case of the car owner, it usually happens that a very small amount of lubricant is purchased per year. Since the price to the car owner includes lubricant, distribution, and frequently the application of the lubricant to the car, the greater cost of the lubricant itself may or may not be an important factor in deciding whether or not an E. P. lubricant is desirable.

The possibility of abrasion or corrosion from certain types of E. P. lubricants should not be overlooked. However, the oil industry is learning how to make E. P. lubricants less likely to cause such troubles, and the bearing manufacturers are learning how to make designs less sensitive to trouble from abrasion or corrosion from the lubricant. In most cases, the danger due to corrosion on steel parts occurs only in the presence of water. Free sulphur in the presence of water stimulates the corrosion of steel but lead soap or certain other materials inhibit this action. A lead soap plus sulphur lubricant is not corrosive to steel even in the presence of water. Free sulphur is usually corrosive to bronze, but lead soap plus sulphur lubricants have been used for many years regardless of this objection. When sulphur is combined with saponifiable oil it is usually noncorrosive to either steel or bronze in the presence or absence of water. On account of the fact that the sulphur is usually so firmly held in such a combination, quite large amounts of the sulphur-saponifiable base must be used in order to secure a very great increase in load carrying ability.

Perhaps the possibility of the lubricant thickening in service is the greatest real source of danger. All mineral oils are subject to thickening or oxidizing at elevated temperatures. In ordinary passenger car use the temperatures are usually low enough so that lubricants which are not especially resistant to oxidation are satisfactory, but for very heavy duty, such as in many trucks or buses, the temperatures are likely to be so high as to require lubricants very resistant to oxidation. In some cases the addition to a lubricant of a material to give it E. P. properties may increase its tendency to oxidation or thickening. When oxidation is the cause of lubrication troubles, it may happen that changing to E. P. lubricants will increase the trouble. Of course, the answer in this case is to change the design so that the temperature is reduced.

When E. P. lubricants were used only in limited production, it was possible for automobile manufacturers to take care of their own distribution problems, but it appears that commercial conditions at the present time are such that the oil industry as a whole must become interested in the manufacture and distribution of E. P. lubricants. Since the E. P. lubricants that are called for in largest amount are of the "mild" rather than the "powerful" type, it may be that distribution of both types may be the answer. However, if a "powerful" E. P. lubricant is required and a "mild" one is supplied, trouble may result.

In general, hypoid gears used in rear axles have required the powerful type of E. P. lubricants, although the requirements of the different "hypoid gear rear axles" of different companies have not always been the same. The difference in the requirements has been due partly to details of design and partly to operating conditions. As examples of differences due to operating conditions, cars with hypoid gear rear axles operating in taxicab service in cities would not be subject to the high speed driving that might be expected in the case of a privately owned car, and gears in rear axles of trucks would normally be expected to be subject to higher loads but lower speeds than similar gears in passenger cars.

TABLE 3—STANDARD ALMEN TEST ON LUBRICANTS

Load	Lubricant No. 1	2	3	4	5	6	7	8	9	10	11	12	13
	Torque												
2	..	..	..	..	..	..	..	..	..	..	..	..	..
4	6	6	6	5	6	6	5	6	7	4	5	5	..
6	(*)	7	8	8	7	7	9	9	10	9	9	9	7
8		(*)	10	10	7	10	12	12	13	13	12	(*)	9
10			11	11	8	12	15	(*)	16	17	15		12
12			13	13	9	13	17		18	58	17		14
14			(*)	15	10	19	19		20	47	22		16
16				16	12	20	21		21	48	26		17
18				(*)	15	20	26		22	55	28		18
20					21	21	27		24	55	30		18
22					19	21	27		26	60	32		18
24					19	22	29		27	60	33		18
26					20	23	30		29	63	33		18
28					21	25	30		33	60	34		18
30					22	25	32		35	61	34		19

*Seized.

TABLE 4—TYPES OF LUBRICANTS
(Used by Bureau of Standards[6])

Lub. No.	Classification
1	Straight mineral oil, S.A.E. 70.
2	Mineral oil plus lard oil.
3	Commercial lead-soap lubricant (noncorrosive).
4	Lead-soap lubricant free from sulphur.
5	Commercial sulphurized lubricant.
6	Sulphur-chloride lubricant (16⅔% base plus 83⅓% lubricant No. 1).
7	Sulphur-chloride lubricant (72 per cent lubricant No. 6 plus 28 per cent lubricant No. 1).
8	Castor oil, U.S.P.
9	Commercial lead-soap lubricant (corrosive).

TABLE 5—RELATIVE LOADS AT SEIZURE ON FOUR MACHINES
Bureau of Standards Tests[7, 8]

Lub. No.	Lubricant testing-machine No. 1	2	3	4
	Relative loads at seizure			
1	1	1	1	1
2	1	1	2	1.5
3	3	4	1	1
4	2	2.5	1	1
5	3	3	3	2
6	4	5	5+	3+
7	1	0	5+	3+
8	2	2.5	2	3
9	2.5	3	5+	2

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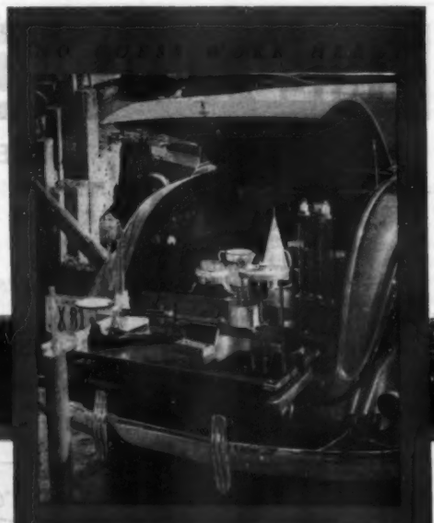

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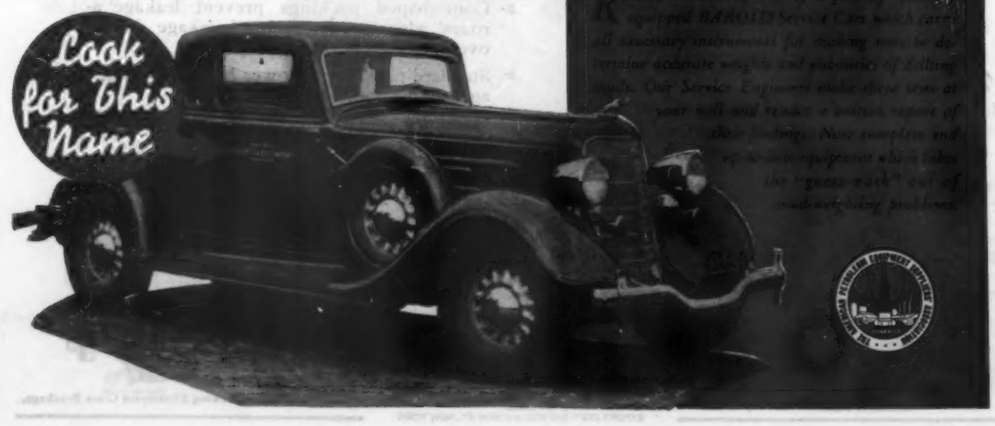

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Probabilities and Wildcats Tested Through Mathematical Manipulation

By J. T. HAYWARD
Barnsdall Oil Co., Tulsa*

The mathematical theory of probabilities was originally developed in connection with games of chance. Now-a-days it has been applied to biology, physics, engineering, and to many business problems; and it is, of course, of fundamental importance in insurance.

Decisions whether to drill or not to drill a wildcat well[1], or to purchase or not to purchase a part interest in royalty under wildcat acreage, have constantly to be made by executives in the land and geological and in the production departments of oil companies. The conclusions depend upon a number of things, among them the cost of the operation, expected return if a sucessful result is obtained, the capital available for the venture, and the probability of a sucessful result. Unless concrete numerical values are assigned to all these quantities, only dubious conclusions can be arrived at; but once numerical values have been assigned, they can be used in a number of simple equations that will facilitate the decisions to be made and place them upon an arithmetical basis.

The primary object of this paper is to discuss the derivation of these equations and their manipulation. A subsidiary and independent object is to outline plans for the classification of wildcat-well data in such a manner that they will be available and handy for use in the equations.

Needless to say, it is not suggested that any mechanical manipulation of formulas can replace expert knowledge and judgment, but it is maintained that the methods outlined in this paper can assist the expert in arriving at his conclusions and in demonstrating to others how he arrived at them.

By way of illustration, let us consider a lottery in which there is a single prize of $60, and for which six tickets are sold. It is obvious that anybody purchasing all six tickets will win $60; and that, therefore, the six tickets are together worth $60. Since the lottery is presupposed to be fair, any one ticket is worth $10. The purchaser of a ticket has a one-in-six[2] chance of winning $60, and his expectation, therefore, is $10. Expressed as an equation, we have: $\frac{\text{Prize}}{\text{No. of tickets}} =$ mathematical value of expectation .....(1)

Again, suppose a die is rolled, and that every time an ace turns up the player is to receive $60. Here also there is a one-in-six chance of winning $60, and each throw is consequently worth $10. There is, nevertheless, an important difference between these two games. In the case of the lottery a purchaser who took all six tickets would be certain of the prize of $60; but the player with the die might pay for, and play, six or more throws without being certain of winning anything. Nevertheless, this does not alter the mathematical value of the expectation.

In mathematical calculations it is customary to express a probability in the form of a ratio in which the numerator corresponds to the number of favorable (or unfavorable) outcomes, and the denominator to the total possible number of outcomes. The probability of a die turning up an ace in a single throw is, for instance, one in six, written 1/6; and of its not turning up an ace, five chances in six, or 5/6. Certainty is under this convention represented by unity. This corresponds with everyday language, ninety-nine chances out of (or in) a hundred denoting "nearly certain", and one hundred out of a hundred (100/100=1) corresponding to certainty.

The mathematical value of the expectation from any event is obtained by multiplying the sum to be realized on the event happening by the probability that the event will happen. Using this notation in the die-throwing game, we get:

Prize × probability (of success) = mathematical value of expectation....(2)

i.e., $60×1/6=$10.

A player paying the mathematical value of the expectation for a chance will, if he has sufficient funds to stay in the game, tend in the long run to break even; if he pay less, he will in the long run profit; and if he pay more, he will be certain in the long run to lose. In all real lotteries, commercial dice games, etc., the chances are sold to the public for more than the mathematical value of the expectation; hence the practically certain profits of the governments and operators and equally certain ultimate losses of the gamblers.

Practical Applications

There are similarities between the buying of a ticket in a lottery and the drilling of a wildcat well, or the purchase of a royalty under undeveloped acreage.

The prize is, of course, the profit realized in case of success.[3] For one drilling a wildcat, it will be the increase in value of his interest in the property, if and when a commercial well is obtained. This is not always easily determined, but it must be remembered that some estimate of the figure—even if a rough one—must be made when any deal is under consideration—even though it is not used in the equations and with the methods outlined in this paper.

The cost of the ticket or chance corresponds to the estimated cost of drilling a well, purchasing the property or an interest (if not already owned) together with any other expenditure required to consummate the deal and complete the well; but less dry-hole money, if any. It is quite possible to estimate this figure and, as a matter of fact, it is usually carefully figured out. For royalty, the matter is definite and simple, the purchase price corresponding to the cost of the ticket or chance.

The Probability of Success: Methods for arriving at this figure are dealt with in a later section of this paper. For use in the equations, probability must, of course, be expressed numerically—preferably as a fraction, as outlined in a previous paragraph. It is surprising, but none the less true, that in everyday practice many deals are discussed and transacted without any concrete figure for the chance or probability being arrived at. The cost of the well, the probable depth, and the profit to be realized from a successful result will be very carefully figured out; but the probability of success will be left at a "sporting chance," "a sure shot," "a fairly good chance," etc. Yet the numerical value of the probability is equally important in determining the desirability, or otherwise of the deal as is the cost or the revenue if successful. Halving the cost of the well will, for instance, have the same effect as doubling the probability. The following are a few examples utilizing the equations and methods so far outlined::

Let P represent what we have defined as the prize.
Let p represent what we have defined as probability (of success).
Let E represent what we have defined as mathematical value of the expectation.

Example 1: An operator is offered a half interest in 5,000 acres located upon a geophysical high in the salt-dome area of the Gulf Coast for $100,000 cash and a well. What is the value of the mathematical expectation?

It is estimated that P, the half interest if a commercial well is obtained, would be worth $10,000,000; and that p, the probability of a commercial well, is one in twenty-four.[4] It is further estimated that the well, if a dry hole, will cost $50,000. The cost of a ticket or chance is, therefore, $150,000. By Equation (2):

Expectation = E = P × p

$10,000,000×1/24=$416,000.

Since the chance is worth $416,000 and it can be bought for $150,000, it apparently is a desirable deal for a purchaser who can afford it.

Example 2: A "step out" is to be started in the Greater Seminole area. It is estimated from records kept on previous similar deals that the probability, p, of a commercial well is 1/5; and that if it is obtained, the royalty under the 40 acres will be worth $800 per acre. What is the present value per acre of the expectation in the royalty? By Equation (2):

E = P × p

$800×1/5=$160=the expectation.

Addition of Probabilities

In every-day practice more complicated problems than those dealt with in the preceding two examples will often be encountered, and it will be frequently necessary to add and/or multiply probabilities. These operations are full of pitfalls, as the following illustrations will show.

If a penny is tossed, the probability of its falling heads is one-half, and of tails is also one-half. To obtain the probability of its falling either heads or tails, we may in this case add the probabilities. This gives unity—which we saw corresponds to certainty—and which obviously is correct in this case, since the coin must fall either heads or tails. But now suppose that the penny is thrown twice, and that we wish to know the probability of getting at least one head. Again the probability of heads is one-half on the first throw and one-half on the second. The sum of these is again unity, or certainty—which is obviously incorrect, since the coin might have fallen tails on both throws.

The following axiom specifies the conditions for which the probabilities may correctly be added:

If an event can happen in one out of several different ways (of which only one can occur) and if two or more of these ways would be considered successful issues, then the probability, C, of success is the sum of the probabilities of the several successful ways in which the event might happen; thus:

$$C=p_1+p_2+p_3, \text{ etc.} \quad \ldots\ldots\ldots (3)$$

Example 3: It is believed that a well being drilled to a certain sand will be either a gas well, an oil well, or a dry hole. If the probability of a gas well is one-third and that of an oil well one-third, what is C, the probability of a commercial well?

This example complies with the condition in the axiom, so the probabilities may be added together; thus—by Equation (3):

$$C=p_1+p_2, \text{ etc.}$$
$$=1/3+1/3=2/3$$

Example 4: Two sands are known to exist on a property: If $P_1=1/4$ is the probability of finding oil in the upper sand, $p_2=1/2$ that of finding it in the lower, what is the probability of finding commercial oil on the property?

Here, as with the penny thrown twice, the conditions of the axiom are not complied with, since both events may occur. Under these circumstances the probability, C, of one and/or the other successful issue is:

$$C=p_1+p_2-(p_1\times p_2) \quad \ldots\ldots (4)$$
$$=1/2+1/4-1/8=5/8$$

It has been shown that a ticket in a lottery has a definite mathematical expectation or value. It is obvious that the mathematical value of two or more tickets will be the sum of their values, and that this is true whether the tick-

JOHN T. HAYWARD

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*Before A.P.I., Dallas, Tex.

[1]The total number of wells drilled in the United States from 1859-1928, inclusive, was 777,882, of which 50,398, or 6.5 per cent were wildcats and 727,484, or 93.5 per cent, were proved-area wells. Of the total wells 73.1 per cent obtained oil, 5.8 per cent gas only, and 21 per cent were dry. Of the wildcat wells 95.2 per cent were dry, and of the proved-area wells 15.9 per cent were dry. In wildcat areas 1 well in 24 opened a new oil area, while in proved areas 1 well in 6 failed to obtain oil or gas: From Petroleum in the United States and Possessions—Ralph Arnold and William J. Kemnitzer, p. 27 (1931).

[2]It is to be noted that 1 to 2 corresponds to 1 in 3; 2 to 3 to 2 in 5, etc.

[3]For the present it is assumed that the receipt of the prize follows (if won) the purchase payment for the chance at a short interval; otherwise the value would have to be discounted at a suitable rate of interest to arrive at present value.

[4]In 1933, 190 wildcats were drilled in the Gulf Coast saltdome area, resulting in eight commercial wells, i.e., 1 in 24.

ets are all for one, or for several lotteries, thus:

$$E=P_1 p_1+P_2 p_2, \text{ etc.} \ldots\ldots\ldots (5)$$

The type of problems dealt with in Examples 3 and 4 could have been answered by working out the expectations according to Formula (5); and, in fact, this will usually be the more convenient method.

Multiplication of Probabilities

Rule: The probability, C, that two or more independent trials should all turn out successfully is the product of their separate probabilities of success; thus:

$$C=p_1\times p_2\times p_3, \text{ etc.} \ldots\ldots\ldots (6)$$

Here again there is a pitfall. The chance of drawing a black card from a full pack is $\frac{26}{52}=\frac{1}{2}$; and the chance of drawing two black cards, in two draws, from two separate packs is $\frac{26}{52}\times\frac{26}{52}=\frac{1}{4}$; but the chance of drawing two black cards in two draws from the same pack is not ¼, but

$$\frac{26}{52}\times\frac{26}{51}=\frac{25}{102}.$$

In the second case the trials are not independent, and in such cases the rule becomes:

The probability that a series of trials should all turn out successfully is the continued product of the probability that the first should be successful, and that when it has been the second should be, and so on.

Example 5: As in Example 4, two sands are known to exist on a property and ¼ is the probability of finding commercial oil in the upper, and ½ that of finding it in the lower. What is the probability, C, of finding commercial oil in both sands? By Equation (6):

$$C=\tfrac{1}{2}\times\tfrac{1}{4}=\tfrac{1}{8}.$$

This should be compared with the probability of finding oil in one or the other sand given in Example 4, viz., ⅝.

Chance Works Toward Monopoly

We have up to the present discussed the mathematical value of an expectation. In a $100 lottery, for instance, if there are 10 equal tickets, the mathematical value of each ticket is $10. It is sometimes erroneously thought that if a purchaser with limited capital continued to buy chances at their mathematical value, he would in the long run neither gain nor lose. The truth is that unless he started wtih infinite capital, he would in the long run be bound to go bankrupt.

If a penny be tossed a great many times, it will not—as everybody knows—fall alternately heads and tails. It is true that the number of heads will tend to equal the number of tails; but as the game proceeds, there will be times when the total number of heads tossed exceeds the total number of tails, and vice versa. Bernoulle's theorem shows that if the game be continued long enough, the chance that the total number of heads exceed the total number of tails, or vice versa, by any pre-assigned number—however large—amounts to certainty.

If a group of boys play pitch and toss for pennies, each starting off with the same capital, the cash will become more and more unevenly distributed as the game proceeds—boy after boy going broke, until only one is left with all of the pennies. That this ultimately will happen amounts to certainty. If, when the game is started, the boys have different amounts of capital, the chances are in favor of the richer, and in proportion to their initial funds. For instance, if there are two in the game, one possessing 30 pence and the other 3 pence, the probability that if, they continue long enough, one or the other will be ruined amounts to a certainty; the odds are 10 to 1 that the player ruined will be the poorer, and on an average this will occur in 90 throws.[5]

Lotteries as Simile

Turning from pitch penny to lotteries, similar reasoning can be shown to apply. A purchaser buying tickets in lotteries of the type already described and paying the exact mathematical value will eventually be ruined—unless, of course, his funds are infinite. This does not mean that the tickets have no value, but that in order to avoid ultimate ruination and to make a profit from the purchase of such tickets (or of corresponding chances in any speculative venture) the purchase price must be less than the mathematical value of the expectation. In other words, the price that a purchaser can afford to pay, if he is ultimately to make a profit, depends not only upon the nature of the venture, but also upon the purchaser's financial status. The mathematical value of the expectation minus a percentage for profit is not the price which a purchaser of limited means can prudently pay for the venture. This price could be paid only by a buyer with infinite funds who could repeat the operation indefinitely without any risk of being stopped by lack of capital. It has been referred to as the mathematical expectation in order to distinguish it from the price that a real purchaser of limited means could prudently pay. Fortunately, the matter is susceptible of mathematical treatment; and on the principle that the advantage of any speculation is to be judged by the effect in the long run, of indefinitely repeating the operation on a scale proportional to the funds then possessed, it is easy to calculate what price may be advantageously paid for any venture. "It is not necessary for this principle to regard the fund in possession as representing the whole of the speculator's property. It may be taken as that portion of his property which he thinks he is able to speculate with. We, therefore, speak of his 'available' funds, designating thereby the funds (whether the whole or the part of his property) which he considers available for the purposes of speculation."[6]

That the fair price a purchaser ought to pay for a venture depends upon the purchaser's available capital, as well as upon the nature of the chance—even though he apparently can easily afford the outlay—appears at times to occasion surprise. It may help to clarify the matter if we approach it from another angle. Consider a wildcatter operating in a territory in which an average of one commercial well is obtained out of each w wells drilled; p, therefore, equals 1/w. Now, although, he can expect in the long run to obtain one commercial well for every w well he drills, there is the possibility of a run of "bad luck" and a string of dry holes. The chance, C, of drilling m dry holes in succession is given by:

$$C=(1-p)^m \ldots\ldots\ldots (7)$$

Concrete Instance

Taking a concrete instance, suppose that in a certain area a ratio of one well is obtained for each 24 drilled.[7] Using this figure in the formulas we get the chance of:

2 dry holes in succession = 0.918
92 in 100
10 dry holes in succession = 0.654
2 in 3
20 dry holes in succession = 0.427
3 in 7
30 dry holes in succession = 0.28
2 in 7
40 dry holes in succession = 0.183
2 in 11
50 dry holes in succession = 0.12
1 in 8
100 dry holes in succession = 0.0142
1 in 70
200 dry holes in succession = 0.0002
1 in 5,000

The foregoing table shows that there is quite a large risk—one in eight—of drilling 50 dry holes in succession, and that the possibility, viz., one in 70, of drilling 100 dry holes without getting a commercial well is by no means negligible. It is, for instance, much greater than the fire risk on a tanker during a voyage across the Atlantic. A penny may be expected to turn up heads once out of every two throws; nevertheless, there is a one-in-sixty-four chance of a string of six heads in succession. Like other hazards, these risks (of a long string of dry holes in succession) could theoretically be offset by insurance. It is obvious that the operator who could stand 50 dry holes in succession without being ruined would, if able to insure against ruination, pay a lower premium than one who could only withstand 10 dry holes. Whereas, at the present time, such insurance cannot be taken out, the risks, different for differently situated operators—must be reflected in the prices paid.

We have in previous examples dealt with the mathematical expectation, i.e., with the price a speculator with infinite funds should give for a chance in order that by repeating the operation he may expect in the long run to be left neither richer nor poorer. The proviso "with infinite funds" makes the answer of no more than academic interest; and what is actually required is to find the price which a speculator with limited available funds may prudently give for a venture, so that by repeating the operation each time on a scale proportionate to his funds at that time he may in the long run break even.

Simplified Formulas

Formulas for this purpose are complicated, but can be simplified on the assumption that the speculator's funds shall be large compared with the sum that he stakes—although not necessarily large compared with the prize he has a chance of winning. These are reasonable assumptions, because no sensible operator (and we are not concerned with the others) would think of staking his whole working capital on a single wildcat.

Whiteworth[8] gives the following approximate formula for the sum which a speculator may pay for any defined expectation.

Let X be the break-even price which may be paid by a speculator whose available fund is n for the chances, p_1, p_2, etc., of receiving prizes worth P_1, P_2, etc., respectively. Then the rigorous equation to determine X is:

$$\left(1+\frac{P_1}{n}-\frac{X}{n}\right)^{p_1}\left(1+\frac{P_2}{n}-\frac{X}{n}\right)^{p_2}\left(1+\frac{P_3}{n}-\frac{X}{n}\right)^{p_3}\text{ etc.}=1 \ldots (8)$$

When X is small compared with n, and there is one prize, P, and the chance of gaining it is p, Formula (8) simplifies as follows:

$$X=\frac{n(n+P)}{n+(1-p)P}\left[\left(1+\frac{P}{n}\right)^p-1\right] \ldots (9)$$

An equation for X.

The following examples will illustrate the application of these formulas and also draw attention to some important conclusions that can be drawn from them

Example 6: A royalty buyer is considering purchasing the royalty under 40 acres upon which a step-out is about to be started. It is estimated that there is a one-in-five chance of obtaining a commercial well, and that the value of the royalty would then be $800 per acre, or $32,000 for the 40. What is (a), the mathematical expectation; (b), the break-even price that the buyer may prudently give if his available funds are $10,000; and, (c), if his available funds are $100,000?

(a) By Equation (2):

$$E=P\times p$$
$$\$32,000\times 1/5=\$6,400.$$

(b) Here:

n = buyer's available fund = $10,000.
p = probability = 1/5.
P = prize = $32,000.
X = break-even price.

By Equation (9):

$$X=\frac{n(n+P)}{n+(1-p)P}\left[\left(1+\frac{P}{n}\right)^p-1\right] \ldots (9)$$
$$=\frac{42,000}{3.56}\times 0.3325=\$3,920.$$

(c) Here:

n = $100,000.
p = 1/5.
P = $32,000.

By Equation (9):

$$X=\frac{n(n+P)}{n+(1-p)P}\left[\left(1+\frac{P}{n}\right)^p-1\right] \ldots (9)$$
$$=\frac{132,000}{1.25}\times 0.0571=\$6,020.$$

Mathematical Expectation

To be observed are the totally different prices obtained by altering the circumstances of the buyer, and these should also be compared with the mathematical expectation.

Example 7: An operator is offered a half interest in 5,000 acres, located on a geophysical high in the salt-dome area of the Gulf Coast, for a well and a cash consideration. It is estimated that a dry hole would cost $55,000; that the half interest, if a commercial well was obtained, would be worth $10,000,000; and that the probability of a commercial well is 1 in 24. What is, (a) the mathematical expectation, (b) the cash consideration that an operator may prudently give in addition to drilling the well if his available funds are $200,000, and (c) if his funds are $5,000,000?

(a) By Equation (2):

$$E=P\times p$$
$$\$10,000,000\times 1/24=\$416,000.$$

(b) Here:

n = $200,000.
p = 1/24.
P = $10,000,000.
X = cash consideration plus cost of well, minus dry-hole money, if any.

By Equation (9):

$$X=\frac{n(n+P)}{n+(1-p)P}\left[\left(1+\frac{P}{n}\right)^p-1\right] \ldots (9)$$
$$=\$285,000\times 0.178=\$50,600.$$

Since the well would cost $55,000, it is obvious that an operator with $200,000 available funds could not prudently undertake the deal—even if no cash consideration was required.

(c) Here:

n = $5,000,000.

By Equation (9):

$$X=\frac{n(n+P)}{n+(1-p)P}\left[\left(1+\frac{P}{n}\right)^p-1\right] \ldots (9)$$

$=5.15\times 4.76\times 10.4=\$246,000$, and the cash consideration $246,000—$55,000=$191,000.

This latter figure, viz., $191,000, is, of course, the break-even cash consideration; and in order to be worth undertaking, the actual cash consideration would have to be less in order to allow for profit. Here again it is interesting to compare the difference in the results ob-

[5] Similar tendencies are present in any speculative game—although they may be masked by antitrust laws, influx of new players, etc.

[6] Choice and Chance, by William Allen Whiteworth, Ma reprint of 5th edn., p. 236, G. E. Stechert & Co., New York (1934).

[7] This was the average for the United States from 1859-1928, inclusive. It was also the average for the Gulf Coast for 1933. This illustration is, of course, theoretical. Here, as elsewhere in this paper, a number of questions of a logical nature remain unanswered, not being essential to the idea it is wished to convey.

[8] Ibid, p. 241.

tained by altering the circumstances of the buyer, and also the figure that even the operator with $5,000,000 in available funds may prudently give, compared with the mathematical expectation.

It is obvious from Formula (9) and the examples given, that a given deal has different values to different operators according to their circumstances — having the higher value to the operator with the larger funds. Many wildcat plays involve no seller, as it is merely a question of whether the chance is worth the cost of drilling a well; but in royalty buying, and drilling deals that involve the transference of part interests, there is a seller as well as a buyer. If now the seller and the buyer are not similarly circumstanced, i.e., if they do not have equal available funds, the fair price that the purchaser may give will not correspond to the fair price that the seller may take. Under these circumstances a deal fair to both sides can only be made when the transference of the interest is from the party with the smaller fund to the party with the larger. When the available funds of both parties (buyer and seller) are large, although not necessarily equal, compared with the mathematical expectation, then the break-even price to both approaches the mathematical expectation —and the statement regarding one-way transference made in the last sentence loses its importance.

Determination of Numerical Value of the Probability

When discussing a deal it is common practice to attach a numerical value to the anticipated recovery per acre, using the best available information to arrive at the amount. This figure is then used in simple equations to arrive at the desirability of the deal if successful. Again, before a wildcat is started, some estimate of the depth in feet is made and used in working out the probable cost. What we wish to emphasize is that, although based on estimates, definite figures are attached to the expected depth, recovery, etc.; and it is not usual to limit the discussions to phrases such as "good recovery," "poor recovery," "deep well," "very deep well," etc. For some reason similar, numerical values are not attached to the probability of obtaining a commercial well; but a scale somewhat as follows is used instead:

No chance of getting a well.
Little chance of getting a well.
A sporting chance.
An even chance of a well.
Good shot.
Almost certain to get a well.
Sure shot.

In the early days of marine insurance, corresponding estimates of the likelihood of a ship arriving safely in port were used; and it was some time before a numerical value based on experience was attached to the risk.

It is the thesis of the present paper that numerical values ought to be given to the probability of getting a well, just as they are to the probable depth, etc.; and that statistical methods should among others, be used to assist in arriving at these numerical values. We are here, of course, dealing with the empirical type of probability, i.e., with the data derived from observation and recording of past events. Insurance deals with the same type of probability.[9] Life-insurance companies rely upon medical reports as well as upon their mortality tables; but in calculating premiums, a definite figure —not a phrase—is given to the expectation. Similarly, statistical tables could be used in conjunction with geological reports, but the expectation ought to be expressed in figures.

There is plenty of information regarding wildcat wells scattered about in the technical journals, etc.; but it is not arranged in a form suitable for the purpose under discussion. Its assembly and arrangement in convenient tables would not be a difficult task, and could be carried out by any one, or more, of a number of organizations. No attempt has been made to undertake this work here; and owing to lack of space, nothing but a very brief discussion of proposed designs for these suggested tables can be included; but a separate paper dealing in greater detail with this aspect of the subject is in course of preparation for submission at some future date.

It appears desirable that the data should be classified under wildcats,[10] semiwildcats, and "step-outs," with subdivision based upon geological grouping. Further sub-division could be made by anyone interested in any special area, and based upon his own records.

Columns for initial productions should be included in the proposed table. Those figures are the arithmetical averages of the initial productions of the commercial wells drilled in the associated group; and indicate, therefore, the size of well that could be expected if a commercial well is obtained. So far in this paper we have considered the probabilities of commercial wells and dry holes, and the size of the well has not entered into the discussion. At the present time data on initial production are almost meaningless, owing to proration schemes. If this were not the case, it would have been more rational to express the expectation in barrels initial, instead of the probability of a commercial well. The expectation of a wildcat would then be equal to the sum of the initial production of the wells in its group, divided by the total number of wells (dry and commercial) in the group. As more and more of this type of information becomes available, frequency poligons based upon initials can be constructed and used when calculating initials.

It may be objected that there is no way of arriving at the probability, that records would be too uncertain, and that luck and the unforeseen will cause actual results to differ from the calculated. Of course, all probability theory implies ignorance; but the figures arrived at for the chances correspond to the best available information at the time. When a man's expectation of life is stated to be, say 10 years, it does not mean that he is going to live 10 years, no more and no less; but it does mean that 10 years is to the best of our knowledge the figure, fair to him and to the company, to use in calculating his life-insurance premiums.

Actually, when drilling or wildcat deals are under discussion, the close haggling over prices and minor advantages shows that the traders have, subconsciously or otherwise, arrived at some very definite value for the probability of success and the expectation. If, for instance, a wealthy buyer offered $133 for the royalty discussed in Example 2, but refused to take it at $160, he must have somehow determined that the probability of success is greater than 1/6, but less than 1/5.

Guess work, of course, still enters into the problems when worked out according to the methods outlined in this paper; but it is believed that the amount of guess work is reduced, and that discussion is clarified. At the same time, we must not fall into the error of believing that because we have attached a number to a chance that we have thereby made a successful issue more sure, or have in any way altered its probability. Further, we must be ever on the watch for that most insidious and widespread superstition that assumes that mathematical manipulation, if sufficiently accurate, involved and prolonged can transmute doubtful data into positive scientific fact.

[9] "A distinction is generally drawn between a priori probability of the type described above (games of chance) and empirical probabilities, knowledge of which is derived from observation or experience. As an example of the latter type we have, as the probability that a man aged 35 will live 10 years, the ratio $\frac{74,173}{81,822}$. This is based upon the American Experience Table of Mortality which shows that of 81,822 men living at the age of 35, there are 74,173 living 10 years later." Statistical Methods by Fredrick Cecil Mills, p. 522.

[10] Ralph Arnold and William J. Kemnitzer define a wildcat as a well one mile or more from production. A more suitable definition for our purpose would be a well located upon a structure upon which a commercial well has not already been obtained.

Beaty Discusses the Code and Federal Legislation

(Continued from Page 44)

know should take the lead and mould the plan. So doing they protect themselves and those for whom they are trustees.

I am not arguing in favor of making a public utility of the oil business. I am simply trying to say that if the public interest demands regulation of any part of this business, and if the facts make a case, the law making power will not hesitate. Of course, some private interests may selfishly object; they usually do. That is on the principle that

No rogue e'er felt the halter draw
With good opinion of the law.

To be concrete, I may say that some effective regulation of the initial branch of this business has been proven essential times without number. A great majority of the industry has been forced to advocate it as a measure of justice and protection. As to the other branches, refining and marketing, the case is not made out. I hope with you that the industry will so conduct itself that regulation in these respects will not become imperative, or, in the language of the President when he signed our code, that it will be "a self-governing industry."

Permanent Federal Legislation

For industry in general an increase of consumption is one answer to overproduction, and is perhaps the best, but additional safeguards may be provided. In the main they should be such as can be held in reserve for emergency use. Despite all prospects of increased consumption, the productive capacity of this country in many lines is so excessive as to challenge business statesmanship. This is true, not so much because of the benefits of smooth running commerce as because of the danger of actual surpluses which can not be consumed. Within certain limits, production, consumption and waste are factors which can be relied upon to seek proper levels, but they can never solve the labor or employment problem. On the contrary they may serve to aggravate it. Voluntary or enforced relief for the unemployed is no answer, or at most an unstaisfactory one. This subject is mentioned in its general aspect for no purpose of proposing a remedy here. It is mentioned merely to show that we have progressed into a new order of things. And this new order extends to the oil industry, where overproduction has still further significance because of its effect upon an irreplaceable natural resource.

There are two schools here. As already indicated, one is opposed to every species of governmental regulation. The other favors certain types, and much divergence of opinion is found there.

It can be said in truth that the first theory is sound according to old conceptions. Thus, for example, when there is too much crude oil the price declines, which in turn discourages exploration and new development until an economic balance is restored. To further illustrate, if the surplus for any reason assumes gross proportions, and the price descends to a level at which there is incentive to buy and store but no incentive to find and develop, the price reacts, and a kind of equilibrium prevails. An important part of this doctrine is the corollary that the less interference with these natural or economic forces the better, and that with increased interference there is increased violence in the inevitable readjustment.

On the other side we have all the modern arguments in favor of industrial planning for the protection of commerce, plus the argument that, owing to the well-entrenched rule of capture, oil is different from other commodities; that unrestrained production usually results in waste in the reservoir and waste from storage; that in extreme cases it depresses prices until as a matter of economy high cost production must be abandoned, contrary to all conceptions of conservation; that the natural earth stratum is the proper storage for oil until it is needed for the use of man, which is a truth of not little importance, and that the old economic rule is not so inexorable that it can not yield to common sense.

To which the fundamentalist rejoins that all of this is theory which can not stand the test and points to the fact that involuntary curtailment must be accomplished through man-made rules, enforced by fallible human agencies, working more injustice than good, as witness the "hot-oil" curse.

Case at Issue

So the case is at issue. Both sides are really thinking more of commerce, of prices and profits, than they are of anything else. And why not? If commerce is out we are back in the dark ages. So let us say commerce **and conservation.**

One thing must be remembered in any discussion of this subject, and that is this: The field is not virgin. Long ago some of the states entered upon the regulation and control of oil production. They regulate or try to regulate it, but without any co-ordination between the states. They vie and race with each other, all urged forward by operators within their respective borders.

It took the petroleum code and the intervention of the Secretary of the Interior to partially halt the race of 1933. The code on this point was known to be none too strong on constitutional grounds but the states subsided as far as politics would permit, failing principally in the enforcement of their own laws. Even state troops had failed in the provention of "hot" oil production. Some of us may be happy now over the absence of crude oil surpluses, but again it is because memory is short. Is it possible that those who prayed aloud for federal control in 1933, and insisted that no other control is worth three whoops, are now gazing hopefully at the states? Have we forgotten the dumping orgies, military rule, 10-cent oil, asset write-offs, passed dividends, defaulted interest, unemployment and general distress of the recent past? Is it not time now to take stock and while our worst pains are allayed make plans for the future against recurrence? Or are we like the Arkansan who refused to repair the roof of his house because when it was raining it was too wet and when it was dry he did not need it? Perhaps we were better described by the bard who said

When the devil was sick the devil a saint would be,
When the devil was well, the devil a saint was he.

State Statutes

I have said the field is not virgin. The great oil-producing States of Texas, Oklahoma and Kansas have statutory systems for the control of production to reasonable market demand. These laws are doubtless on the statute books to stay. Certainly we can not assume that they will be speedily repealed. If they have resulted in a "hot" oil dilemma it is because of their lack of enforcement, and it would seem better to make constructive suggestions looking to enforcement than to throw up hands and hope for repeal. In the language of Grover Cleveland, "it is a condition and not a theory that confronts us." The march has been started. We must proceed or beat a retreat. The prospects in the rear are not alluring. We can not stand still. The fact is that whether we like it or not, the three states will not retreat. Nor should they. Their systems need coordinating, and California should be brought in, voluntarily if possible, involuntarily if need be. Nothing but a federal act of some kind can accomplish the purposes. Such an act should supplement and not supersede the states. It should round out the systems and better insure enforcement. The objective would be nothing new or startling, nothing revolutionary or unsound, but simply a completion of what the states with such good reason have begun.

We are alive enough to know that the menace of overproduction is still with us. Never have we had so many and such large proven reserves corked

up. The wells now producing could meet the demand for many, many months to come. Exploration is going forward and is not going to be stopped. Potential reserves, the basis of exploration, offer almost unlimited possibilities. And the definite trend over a period of years indicates enlargement rather than contraction of the problem. In the last quarter of a century the stream of surplus has built up like water going to the sea. There have been a few peaceful stretches, but the breadth and depth eventually and unerringly have grown greater and greater. Glenn Pool in retrospect looks like a little rill. But see the inflows. Cushing, Crichton, Burbank, Seminole, Signal Hill and Santa Fe Springs are typical over the years, until finally in rushed Oklahoma City, Yates, Van, Kettleman Hills and East Texas. Where is the ocean?

There is, of course, the argument against interfering with these forces if they will correct themselves. By which token it is wrong to build levies and dams. Perhaps we should stand still and see the salvation of the Lord.

Permanent Legislation

The Recovery Act and all codes under it are expiring in seven months. Whatever may be the policy of Congress in regard to extensions this is an appropriate time to consider fdeeral legislation for oil on a permanent basis. There have been serious questions under our code both as to the power of Congress to delegate the functions asserted and as to the intention to delegate some of them. All of these questions could be cleared up by a direct statute. I think it should be done so far as crude oil is concerned.

And, while production is now held in balance, there is no assurance of continued control after the middle of June or even in the meantime. "Hot" oil continues to be produced in substantial though lessened quantities. This is an outrage. And if the probability of direct federal legislation should disappear the situation, in my opinion, would immediately grow worse. That, plus any breakdown in present enforcement, might easily make it worse than it ever was in the past.

Thomas-Disney Bill

At the last session of Congress a bill was introduced in both houses to regulate crude oil supply in times of overproduction. It has become known as the Thomas-Disney bill. The measure was the result of collaboration by lawyers of the industry and the Administrative Board. It had the approval of the Planning and Coordination Committee and was sponsored by the Administrator. The method of control was not the restriction of production, but was the establishment of quotas in commerce for states, pools and properties, including storage, and the establishment of import quotas in like manner. The policy clause recited, inter alia:

> This commerce, a large part of which is interstate or foreign, is found to be of such a nature that any regulation herein contemplated, to be effective and fair, must regard commerce as a unit and establish quotas therein, irrespective of whether transactions are in interstate or intrastate commerce or whether there is exportation or importation, except as otherwise provided in this Act.

A section provided for the establishment of production quotas in event and only in event it should be found necessary for the enforcement of quotas in commerce.

The administrative machinery, which was prescribed at length, was to be placed in the hands of the Secretary of the Interior and a board to be appointed by him.

Finally it was provided that powers under act should be suspended from time when the current potential producing capacity of the United States and imports are not in excess of domestic consumptive demand and exports, this to be determined by the board with the approval of the Secretary.

This bill was introduced late in the session and was not disposed of, but the House appointed a committee headed by Hon. William P. Cole of Maryland, to investigate and report. The Cole Committee will now soon conclude its hearings.

Following the adjournment of Congress there was renewed a discussion, originating several years ago, of the feasibility of compacts by the oil producing states to curtail and allocate production and otherwise deal with producing problems.

Compact Plan

The entire subject came before our committee again at a recent meeting, at which 21 out of 22 voting members were present, and the Committee again approved the Thomas-Disney type of legislation, coupled with a compact plan, by the vote of 18 members, three others not voting, as set forth in the following memorandum, which is subject to a final and satisfactory draft of the bill in detail:

> Insert provisions in Thomas-Disney bill authorizing any two or more states under appropriate state legislation to enter into compact for the restriction of crude oil production in the signatory states, subject to the condition that the total allowed production for all the signatory states combined shall not be (more or) less than the total production demand for such states combined as determined under the federal act.
>
> Provide further that so long as the production of any state is kept within the compact figure for such state, or, if the state is not signatory to such compact, then within the production demand figure for the state, as fixed under the federal act, no quotas shall be set for the state or for application within the state, but if in any calendar month any state shall exceed its compact figure, or, in the absence of compact, its production demand figure as fixed under the federal act, then, upon order of the President or with his approval, quotas shall be set for such state and for pools, properties, etc., within the state, as provided in the federal act, until the President finds that necessity no longer exists and orders discontinuation of the practice.
>
> Change the administrative sections so that the Board will be composed of the Secretary of the Interior as chairman and four or six other members to be appointed by the President consisting of men experienced in the oil business and otherwise qualified from the oil producing states, the appointments to be distributed so that as nearly as practicable each principal oil producing section will be fairly represented.

A National Policy

This would give the state compact plan all scope and function consistent with a national policy. If and when state compacts are entered into the activities of the federal agency, so far as the signatory states are concerned and so long as they do their part, would be limited to statistical work and the fixing of national allowables. Some authority in these latter respects must rest in the federal agency if a balanced condition is to exist. The plan would only slightly enlarge the former work of the Bureau of Mines. The states, of course, would not be permitted to combine and swell their production beyond the national allowable. Nor would they be allowed to combine and diminish it to the point of creating a shortage to the detriment of other states or the public. In other words, the states within proper limits would have free hands to deal with the production problem. And it is submitted that this in good conscience should satisfy the most ardent advocate of state rights.

When the compact plan was being considered a few years ago I was one of its advocates. It was the best thing then in sight. Feasibility was not clear then and is not now. If it can be accomplished it should have the right of way. But the difficulties of accomplishment should be kept in mind for no sincere advocate of control would care to stake everything on a remote chance.

Difficulties in Way

After Congress has given permission to the states each state entering into compact and having a system of production control will find it necessary to rearrange its system by legislative act. Its law will have to be changed so that, instead of basing allowables upon market demand as determined by state authority, they will be based upon market demand, or what not, as determined by some other authority, meaning either joint state authority or a federal agency. Section after section of most statutes will have to be revised in conformity with the new scheme, and these revisions will have to receive the affirmative approval of the respective legislatures. Any legislative balking will be fatal. We all know that legislative mills grind slowly and that often the plainest and most salutary measures meet delay if not defeat. Politics and trading play their part and it too often happens that well considered bills come out of the legislature so disfigured that parentage is denied.

But assuming that everything goes well in the various legislatures, and that compacts are actually entered into, there is still the question of state enforcement. We have witnessed many efforts of state enforcement. Not even the states can boast of thier performance under this head. Under compacts, California would have no right to enforce in Texas, and vice versa. The same thing goes in every direction. Neither would all the states but one combined have power to do anything in that one state. If the power to enforce in the states is to be lodged in the Federal Government we are at once away from the state compact plan and might as well go the whole distance. Indeed, it would be necessary to go the whole distance, because no action of the Federal Government directed merely against a state could have any practical effect upon properties or operators within such state. They could not be required to respond collectively or separately to an order made against the state. To be sure, decisions made jointly by the states might be persuasive. But something more than persuasion is needed. The requirement of the hour is a law with teeth.

Teeth Needed

Very likely the plan which I have presented would encourage the states to form compacts. It would be saying to them, "You may compact if you like but unless and until you do the federal agency will function." This would be a forceful argument to the hesitant legislator. It would also have a wholesome effect upon state enforcement authorities, for it would be saying to them, "If you do not enforce the Federal Government will."

I have spoken many times and written reams on the subject of quotas in commerce, and it is not my purpose to weary you now with a tedious constitutional argument. It would seem better to deal with practical aspects here and discuss the constitutional questions in another forum. It is necessary to say, however, that in considering Federal legislation the reason for approach through quotas in commerce, instead of direct control of production, is that the authority of Congress to deal with production on private property in the states is doubtful, to say the least, whereas its authority is plenary when dealing with commerce among the states, which means any commerce that affects more states than one. Of course, the direct route of production control would be simple. But, after all, commerce is a very important thing. It can be dealt with by Congress. Not so with production; Congress must observe those paths laid out in the fundamental law. The fact that quotas in commerce would effect production is no valid legal objection, because such effect would be secondary and not primary. Practically and apart from law an effect is an effect.

There has been some confusion, if not bewilderment, on quotas in commerce. The question has been asked how Congress dealing with interstate commerce can fix quotas that will include intrastate business. The answer is that when a commerce is of an intermingled nature, as ours is, Congress can deal with it as a unit. Every oil man knows that the recitals in the Thomas-Disney bill which I have quoted are true, and that quotas in commerce, if applicable only to commerce across state lines, would be both fruitless and confusing, working injury to the large producing states, and of no real benefit anywhere. The unit theory therefore is most applicable, and it is but an adaptation to intermingled commerce of Marshall's conception of what is meant by "commerce among the states." But I promised not to discuss the Constitution.

Federal Authority

My thought is that, apart from factual studies and statistical work, the federal agency would take no action so long as the production of the country and imports were in balance with demand for domestic consumption and export. It is conceivable that through co-operation and state enforcement of state orders or through state compacts, with the federal law in the background, it might never be necessary for the Federal agency to go farther. But upon the occurrence, despite state efforts, of excess production and its movement into commerce in excessive quantities, the Federal agency would intervene. Such situation would be conclusive that too much oil was coming from somewhere. Exports being at a rate found proper and fair, the fixing of domestic quotas in commerce would be in order. They might be fixed for and in a single state or for and in several or all of the producing states. But quotas in commerce would be fixed.

For the same reasons that stripper wells and settled production are virtually exempt from restrictions now they would be exempt under the quotas-in-commerce system. In other words, their production would be free to move in commerce without let or hindrance from any source. On the hypothesis that present production allocations to states, and those by state authority to pools and properties, would be fair and proper if restrictions were upon a production basis, it may be assumed that commerce quotas would correspond to them in quantity. Only flush pools and properties would presently be affected by the new system. Other flush areas would be similarly affected upon their advent. Commerce quotas would be fixed for those areas and only those areas turning excessive quantities into commerce.

To Deal With Sales

It would be futile, of course, to fix them for states and pools and stop there. This is true because, as previously indicated, neither the state nor the pool could respond; there would be no way to enforce an order so general; hence the necessity of fixing commerce quotas for individual wells or properties. This, of course, could be done on the same basis that production allowables are now fixed. An inspection of the Thomas-Disney bill will show how carefully this was provided for. The states would be left free to exert all their powers to prevent overproduction, but if it should occur, or if any state not in accord with the federal agency should approve or tolerate excess production, the excess would be under ban against sale, exchange, consignment, or other act of commerce. In a broad sense the federal act and the federal agency would simply deal with sales instead of production.

Someone may inquire whether in that case production would not run wild. Such a question would presuppose failure of state control. But, granting such failure, there would remain the fact that oil produced in excess of the federal quota for commerce, or oil commingled with

other oil of such origin, or products derived from either of the two, could not be sold, exchanged, consigned or otherwise moved in commerce of any kind. The ban would be total and complete and the surplus oil would be unsalable. Any purchaser thereof would be subject to the per barrel penalty.

The explanation has been of quotas in commerce from current production. Withdrawals from storage and imports would also be subject to quota or permit as provided in the bill.

Penalty Proposed

The penalty of 50 cents or a dollar per barrel would certainly deter every responsible company or operator. The records which they would be required to keep, or would of necessity keep, would place them in the position of the railroads which were effectively stopped from cutting rates, giving rebates, and false billing. No responsible company or operator would brave the penalty even if the desire to violate was present. The burden of policing would fade away so far as this part of the industry is concerned. The heavy, heavy hanging over the head, the continuing liability to be enforced later, would be a wholly sufficient deterrent. The rascally or rebellious operator would be subject, of course, to the same rules, and he could also be policed. One serious defect in existing laws is the inadequacy of penalty.

As to movements antedating commerce, that is, shipments from an owner to himself in another state, and his effort to turn the goods into commerce there, it should be sufficient to observe that the penalties just mentioned would apply at the place of sale.

A Proposed State Law

Please do not charge me with legislative mania. I know there are too many laws on the statute books already. What I am about to suggest may be presumptuous. The intention is constructive.

To get away from bureaucracy and back to the realm of the courts where justice is dispensed both east and west of the Pecos, it might be wise to set a private penalty for drainage through the "hot" oil channel, not to call it theft. Really it is remarkable that no effort appears to have been made in that direction. I suggest a short state statute reading substantially as follows:

> When an oil pool is under proration or restriction upon production by authority of law, and any operator during any month shall produce more than his fixed allowable from any well, the owner of the nearest producing well located on other property and the same structure, in addition to other remedies at law or in equity, shall be entitled to recover of the offending operator the full value of the oil so produced in excess of the allowable, may apply for and obtain an attachment against the property of such operator without showing any other statutory ground therefor, and shall also have a lien upon the offending well and its equipment. A lessee of the land, or owner of the working interest, may maintain suit for the benefit of himself and the royalty owner. In the event the owner of the nearest well does not bring suit within sixty days after the end of the month the cause of action shall revert to the owner of the next nearest well so located and he shall have the same period in which to sue. In like manner it shall revert successively for four such periods. And in any suit hereunder either party may file interrogatories to the other party, or, in case of artificial persons, to any officer thereof or manager of the property, and obtain without notice a commission to take his depositions. Interrogatories which the witness refuses to answer or answers evasively shall be taken as confessed.

Such an act would seem within the sustained principle of double damages. It would be another stab in the ribs of our old friend, the Rule of Capture, and it would make the "hot" oil man watch his step. It might even give some harassed producer or worthy lawyer a few shekels. If a state should feel that it is statute ridden it might repeal the law against crap shooting.

Conclusion

This effort would be incomplete if I did not appeal, as I do now, to all leaders of the industry and to the rank and file to come into accord; to face crude oil surpluses as a present and future problem; to urge effective measures which will stamp out the "hot" oil racket once and for all; to cease carping about government interference with business and endeavor to mould a law which the industry alone knows how to mould; and to substitute "do it now" for "laissez nous faire."

I am not trying to run your business or to tell you how it should be run. That is your affair. What has been said is from deep conviction. Forgive me if I have spoken too bluntly or seem unduly persistent. It is unfortunate perhaps that our efforts of the last few years have reached the present stage at a time when business men are frightened and timid, when they are in fear of bureaucracy and regimentation, when the public-utility bogy stalks abroad. But we have only to use our faculties to realize the necessity of going forward and doing that which should be done, no more and no less, while yet we may have a voice.

Remember this too: The industry's whole house must be put in order. There are too many wage earners and small operators, such as producers and retail dealers, to permit a continuation of doubtful and depressing practices without an appeal for protection all along the line. There are too many qualified voters who are also stockholders in the watching and waiting category. Seeing supply and demand in balance and consumption enormous these groups will not wait forever. They are doubtless wondering now why these price wars. The theory that supply and demand control price is being put to the test. Through the administration of the code supply has been balanced with demand. The industry can not be fed with a spoon. If something does not happen now the next place is the psychopathic ward. But let us not admit we are going there.

Let us come together and stay together on what we have hitherto regarded as the fundamental point, the absolute control of crude oil supply, and then work hard and think hard on the other problems while there remains a chance to do our own thinking. We should be able to see eye to eye on that kind of a program.

New Method of Classifying Diesel Oil Presented by A.S.T.M. Committee

Manufacturers and users of Diesel engines, as well as petroleum refiners and distributors, have long felt the need for some classification differentiating types of fuel oils suitable for Diesel-type engines. In an attempt to supply this need, the American Society for Testing Materails has developed a classification covering five grades of oil. This work was completed recently by Technical Committee C on Fuel Oils (including Diesel fuel) of Committee D-2 on Petroleum Products and Lubricants. It is not the intention of the committee that this classification should be used as purchase specifications, but rather that fuels purchased be correlated according to the proposed classification in order to determine its usefulness. A series of Diesel fuel-oil specifications should evolve as a result of this program. Criticism and comment should be forwarded to R. P. Anderson, secretary of Committee D-2 on Petroleum Products and Lubricants, 50 West Fiftieth Street, New York City.

All but three of the tests indicated in the table are standard A.S.T.M. tests designated as follows:

Flashpoint	D-93
Viscosity	D-88
Carbon residue	D-189
Pourpoint	D-97
Sulphur	D-129

The ash determination is made by the following procedure:

Place 10 g. of the fuel oil in a weighted uncovered platinum crucible of a capacity not greater than 100 ml. and heat gently with a Bunsen burner until the oil fires and continues to burn when the flame of the burner is applied to the surface of the oil. Allow the oil to burn without further application of heat. The oil will continue to burn until practically all of it has disappeared. The time required will be about 50 minutes. Then place the platinum crucible in a gas or electric furnace and heat to a bright red heat until all carbon is consumed. Cool, weigh and report the residue as ash expressed as a percentage of the original 10 g. sample.

Due to the fact that none of the methods of testing the ignition quality of the Diesel oil have been sufficiently correlated with service performance, no definite limits have been set in the classification table. A prolonged study of ignition in Diesel engines has established this characteristic as one of the most important. According to the present opinion, combustion knock in a fuel-oil injection engine is caused by the accumulation of fuel in its cylinders prior to ignition. Even under conditions that insure ignition, the fuel may not ignite instantly but only after a definite delay. The longer this delay the more fuel accumulates in the cylinders, which then burns unevenly, finally causing audible knock. If the delay is extreme, the engine will fail to operate with the fuel. It is significant that every factor which tends to aggravate knocking in a spark-ignition gasoline engine tends to suppress it in Diesel engines. Fuels of paraffin base consisting chiefly of saturated straight-chain hydrocarbons give the smoothest combustion in general, while naphthenes and aromatics burn roughly at low compression ratios. It is known that highly cracked products give trouble and also that the amount of trouble is increased as the speed of the engine is increased. Turbulence in the charging mixture reduces the delay period and turbulence is a controlling factor in engine speed. It is now generally agreed that ignition quality is one of the most important characteristics of Diesel fuels. The committee realizes the impossibility of reducing all types and designs of engines to a common rating for fuel-burning characteristics. Engine factors, such as combustion-chamber design, turbulence, spray characteristics, compression ratio, injection timing, and engine speed, vary greatly in different engine makes. Tests of ignitibility on various types of engines have no theoretical significance but have provided practical data for the types and sizes of engines on which the tests were performed. Fuel characteristics are based on a study of field-engine performance correlated with laboratory ratings of various test fuels. Ignitibility, one of the most important characteristics from the standpoint of satisfactory engine operation, has been measured by such indices of performance as Diesel index number, cetene number and critical compression ratio. An explanation of these tests, together with suggested limits for oil grades numbered 1-D, 3-D and 4-D appears on Page 67, issue of November 1 of The Oil and Gas Journal under the heading, "Cetene and Index Numbers and Critical Compression Ratio."

DIESEL-FUEL OIL CLASSIFICATION

Grade of Diesel fuel—		Flash °F. Min.[f]	Water and sediment % Max.	Saybolt vis. at 100°F. Min.	Saybolt vis. at 100°F. Max.	Furol vis. at 122°F. Max.	%Carbon Max.	%Ash Max.	Pourpoint Max.[h]	Sulphur	Ignition quality
No. 1-D[a]	A distillate oil for use in engines requiring a low-viscosity fuel	115 or legal	0.05	32	50	...	0.2	0.01	35	[i]	[j]
No. 3-D[b]	A distillate oil for use in engines requiring a medium-low-viscosity fuel	150	0.02	32	70	...	0.5	0.02	35	[i]	[j]
No. 4-D[c]	An oil for use in engines requiring a medium-low-viscosity fuel	150	0.6	..	500	...	2.0	0.04	35	[i]	[j]
No. 5-D[d]	An oil for use in engines permitting a medium-high-viscosity fuel	150	[g]	..	...	100	6.0	0.08	40	[i]	[j]
No. 6-D[e]	An oil for use in engines of special design for high-viscosity fuels and after engine manufacturers' recommendations only	150	[g]	..	...	300	10.0	0.12	40	[i]	[j]

[a] Grade No. 1-D is recommended for mechanical (solid)-injection engines of the high speed type; in general, for engine speeds over 1,000 r.p.m.

[b] Grade No. 3-D is recommended for mechanical (solid)-injection engines of the medium-speed type; in general, for engine speeds from 260 to 1,000 r.p.m.

[c] Grade No. 4-D is recommended for air-injection engines, both two and four-stroke cycle types, with speeds not over 400 r.p.m. Grade 4-D can be used for mechanical (solid)-injection engines with cylinder diameters over 16 inches and speed under 240 r.p.m., but approved heating equipment furnished by the engine manufacturer is recommended.

[d] Grade No. 5-D is recommended for air-injection engines of the slow-speed type; speed under 240 r.p.m. Manufacturer should be consulted for approved heating equipment.

[e] Grade No. 6-D is not regularly used for Diesel engines and is not recommended unless tested and approved by engine manufacturer. The purchaser should be informed regarding high maintenance cost of engines and operating problems involved in the use of this grade of fuel.

[f] Minimum flashpoint as stated or as required by local fire regulations, Fire Underwriters or state laws.

[g] To be inserted later.

[h] Lower pourpoints may be specified whenever required by local temperature conditions to facilitate storage and use, although it should not be necessary to specify a pourpoint of less than 0F.

[i] So far as known, sulphur content need not be considered as regards combustion characteristics. However, a maximum of 2 per cent is suggested to purchasers operating engines in intermittent service, to limit corrosion.

[j] See discussion under Methods of Testing, Paragraph (g) Ignition Quality.

I. A. A. CONVENTION

The thirty-fifth annual convention of the International Acetylene Association is being held in Pittsburgh, Pa., this week. The program includes papers on steel mill applications, recent metallurgical developments, pipe welding and testing, transportation and safety.

Gasoline Buying Program Delayed

(Continued from Page 36)

independent contractor by any legitimate and honorable means, but it does prevent an employer from changing or attempting to change the status of his employes by any subterfuge or device of any nature or kind, whereby an employe, while appearing to have assumed the status of an independent contractor, still retains in fact the essential characteristics of an employe."

This was accomplished by a short statement that any other interpretation of that section was unconstitutional, and would so interfere with the rights of every employe as to make such action clearly illegal.

Section 8 reads as follows: "The provisions of this code regulating hours of labor and wages of employes shall be deemed violated by any device or method by which employes, as recognized in the industry on July 1, 1933, are, or are attempted to be removed from such present recognized status of employes by means of drilling contracts, commission contracts, lease and agency, or any other agreement."

Objection to the present definition of "employe" was raised by the industry on the ground that it included in its general language individuals who could not possibly be termed employes, the definition holding that anyone operating a filling station under lease from the company supplying the station was an employe of the supplying company, as well as any employe of such station operator. Mr. Titus and other witnesses for the industry maintained that such a construction was illegal. It was also brought out that the supplying company would also be liable for the acts of each of the station attendants, which would place an undue burden on the supplying company.

A definition was suggested which would remove this liability on the part of the supplying company, but this definition was objected to by the labor organizations, principally because it would result in the loss of many members of their unions.

Since the hearings on these subjects it has been learned that a tentative date, December 3, 1934, has been set for the purpose of holding public hearings to consider the revisions of all of the labor provisions of the code. This is being done in answer to the petition of the International Association of Oil Field, Gas Well and Refinery Workers that such action be taken. When this petition was presented Administrator Ickes was not in accord with the wishes of the union, but apparently he has decided to call such a hearing and consider the question on its merits.

Administrator Ickes has signed an order to permit the production of 32,960,000 bbls. of gasoline during December to meet the estimated demand of 30,760,000 bbls. The difference of 2,200,000 bbls. was allowed because the maintenance of desirable economic levels of gasoline inventories requires this increase.

The Planning and Coordination Committee of the petroleum industry is in agreement with the order.

Rig Building Order

Administrator Ickes has ordered establishment of minimum wages for skilled occupation in derrick and rig building occupations in four oil producing states. For Oklahoma and Kansas the rate was fixed at $1.25 an hour, and $1.50 an hour for crew foremen. For Texas and New Mexico, the skilled rate was fixed at $1.50 an hour, with crew foremen to receive a minimum of $1.75 an hour.

The Planning and Coordination Committee of the oil industry had recommended rates 25 cents per hour lower. However, the Petroleum Labor Policy Board, after hearings, disapproved this recommendation, and in turn recommended to Administrator Ickes the higher rates, which were approved.

CRUDE PRICE CHANGES

Mid-Continent 36 Gravity
1914—1934

Date—		Price
1914	Jan. 1	$1.03
	Feb. 2	1.05
	Apr. 8	1.00
	Apr. 10	.95
	Apr. 13	.90
	Apr. 15	.85
	Apr. 27	.80
	Apr. 30	.75
	Sept. 12	.65
	Sept. 21	.55
1915	Feb. 8	.45
	Feb. 15	.40
	Aug. 2	.50
	Aug. 4	.55
	Aug. 11	.60
	Aug. 19	.65
	Aug. 21	.75
	Sept. 11	.80
	Nov. 13	.90
	Nov. 15	1.00
	Dec. 13	1.10
	Dec. 14	1.20
1916	Jan. 20	1.25
	Jan. 26	1.30
	Mar. 4	1.40
	Mar. 11	1.45
	Mar. 14	1.55
	July 24	1.45
	July 29	1.35
	Aug. 1	1.25
	Aug. 7	1.15
	Aug. 12	1.05
	Aug. 15	.95
	Aug. 26	.90
	Nov. 29	1.00
	Dec. 12	1.10
	Dec. 18	1.20
	Dec. 23	1.30
	Dec. 28	1.40
1917	Jan. 3	1.50
	Jan. 6	1.60
	Jan. 12	1.70
	Aug. 15	1.90
	Aug. 18	2.00
1918	Mar. 19	2.25
1919	Nov. 20	2.50
	Dec. 20	2.75
1920	Jan. 6	3.00
	Feb. 27	3.25
	Mar. 1	3.50
1921	Jan. 24	3.00
	Jan. 31	2.50
	Feb. 4	2.00
	Feb. 10	1.75
	May 2	1.50
	June 13	1.25
	June 15	1.00
	Oct. 1	1.25
	Oct. 7	1.50
	Nov. 7	2.00
1922	July 15	1.75
	July 18	1.50
	Aug. 2	1.25
	Nov. 22	1.40
1923	Jan. 13	1.50
	Jan. 17	1.60
	Jan. 27	1.70
	Feb. 2	1.80
	Feb. 10	1.90
	Feb. 17	2.00
	Apr. 23	1.90
	May 2	1.80
	May 5	1.70
	May 12	1.60
	Sept. 19	1.30
	Nov. 8	1.00
1924	Jan. 9	1.40
	Jan. 19	1.60
	Feb. 2	1.85
	Mar. 8	2.00
	July 17	1.75
	July 28	1.50
	Sept. 17	1.25
1925	Jan. 22	1.50
	Jan. 30	1.70
	Feb. 12	1.95
	Feb. 17	2.00
	July 10	2.04
	Aug. 27	1.79
1926	Feb. 1	2.04
	May 15	2.29
	Nov. 17	1.90
1927	Feb. 22	1.67
	Mar. 5	1.47
	Mar. 12	1.28
1928	July 26	1.36
1929	Jan. 25	1.20
	May 20	1.45
1930	Feb. 15	1.20
	Apr. 10	1.20
	Oct. 27	.95
1931	Mar. 5	.59
	June 1	.33
	July 9	.18
	July 24	.38
	Aug. 22	.62
	Nov. 2	.77
1932	Apr. 1	.92
	Dec. 15	.69
1933	Jan. 18	.44
	May 6	.25
	June 17	.44
	July 6	.54
	Aug. 25	.64
	Sept. 8	.89
	Sept. 20	1.00

Total Demand Last Quarter Will Show Little Increase

(Continued from Page 46)

of 15.1 per cent is less than the accumulative totals earlier in the year.

The total demand for lubricating oils which was running 30 per cent ahead of 1933 early this year has shifted so that for the entire nine months exports are less than in 1933 with the gain in domestic demand reduced to 11.6 per cent. Both the domestic and export demands were less in September than in September, 1933. This decrease in shipments has been explained in part as due to changes in method of manufacture and specifications of products with predictions that data for the last quarter of the year will show a gain over 1933.

For the first time this year there was a slight decrease in wax stocks in September, brought about by gains in domestic demand and exports. The stocks on September 30 as shown in the table were 47.5 per cent greater than on the same date in 1933 with a decrease of almost 25 per cent in total demand the first nine months of this year.

East Coast Gasoline Situation Is Unchanged

(Continued from Page 55)

adequate. In the industrial end the tank car price in New York is 4 cents.

In the lubricating oil end steam-refined stocks and bright stocks—both Pennsylvania and western grades—are weak with any price changes on the downside. Pennsylvania bright in barrels was quoted as low as 22 cents.

The demand for practically all grades of wax is slow including crude scale which has been stronger than the refined grades. Prices on 124-126 crude scale ranges from 3⅛ to 3¼ cents per pound.

Export Prices

Export prices at the Gulf Coast on gasoline have been advanced fractionally. Most sellers are quoting the 375 end-point grade at 4½ cents.

The kerosene export market also has strengthened with little material being offered. Prices range from 4 to 4⅝ cents for the white grades.

ACID

Practical oil men everywhere recognize the value of acid treatment for their lime wells. To avoid damage to your well, and to be most effective, treatment should be done by practical well men experienced in this line of work with equipment capable of handling any emergency which may arise.

We have treated more wells in the Mid-Continent area than any other company.

Why take a chance with anyone less experienced?

The Chemical Process Company, Inc.

Main Office: Breckenridge, Texas

Call our nearest service office:

Wichita, Kansas—Tel. 2-2478—Rufus Clay
Seminole, Oklahoma—Tel. 844—J. B. D. Woodburn
Big Spring, Texas—Tel. 285—D. B. Striplin
Wichita Falls, Texas—Tel. 2-4307—W. E. (Bill) Norton
Breckenridge, Texas—Tel. 206—P. W. Pitzer, C. K. West, C. F. Hogan, G. R. Whitney

Price Advances in Chicago District Halt Until Important Points Are Settled

By SPECIAL CORRESPONDENT

CHICAGO, Nov. 12.—Tank car petroleum products prices are holding firm to strong here but the advance which has been noted in the last two weeks appears to have come to a halt, pending the outcome of at least two important uncertainties, which also have considerable mutual effect. One is the hearing in Federal Court on the legality of the Federal Tender Board's acts in East Texas. The other is the status of tank wagon and service station markets in the central states. Guesswork prevails in the minds of the trade as to each of these elements. Each, incidentally, is apparently of great moment in determining tank car prices over the rest of the year.

Continued bottling up of East Texas as a source of new supplies of spot market gasoline is keeping the tank car price here strong at the best levels yet reached in the upturn. However, the fact that tank wagon and service station prices have been slow in following tank car prices on up seems to have stopped the advance for the present. Jobbers, in view of the upset conditions in their home markets, are adverse to spot market purchases wherever they can be avoided, although they continue to rush orders for contract shipments to their suppliers in large quantities, indicating again that gallonage is running good generally.

Wait for Settlement

Some observers advance the theory the leading marketing companies do not wish to put through far-reaching retail price advances until the newly reduced dealer margins have been made effective and actually are at work; and until the troublesome question of retail price differentials between various classes of sellers has been disposed of. The former question is due for a showdown around December 1, when the new contracts of the oil companies with dealers, carrying the reduced discount provisions, are to become effective. Dealers, particularly in Chicago, are divided in their attitude. The Chicago Service Station Operators Association especially is rebellious and its officials declare the reductions will not be accepted. They are advancing a plan for adjusted margins, which would replace the proposed one-half cent to 1-cent reductions in the majors' plans with a sliding scale plan which would reach a high of 6 cents on a normal market. However, it is understood that nearly two-thirds of the dealers in the Chicago district already have accepted and signed the majors' new contracts calling for the reductions.

Kerosene

Somewhat better interest is evident in kerosene, despite lateness of the season. Prices have been pushed up a trifle farther. Offerings of high-grade kerosenes are not at all plentiful.

Trouble on Differential

Considerable doubt exists as to whether any voluntary agreement on retail price differentials can be effected. Ideas are far apart. Executives of various majors are vigorously opposed to any such plan.

In the tank car market, sellers and buyers are now paying attention to the question of new jobber contracts for 1935. It is reported refiners favor continuation of something like the present octane breakup for the present, despite considerable criticism which recently has been leveled against it.

Winter Gasolines

Leading oil companies are announcing special winter gasolines for the public. Bearing out this tendency, jobbers in

(Continued on Page 140)

Crude Oil Prices

(Continued from Page 57)

Humble Oil & Refining Co. and Texas Co Effective September 30 in Salt Flat by Shell Petroleum Corp.

Rocky Mountain States

Ilex, light (Sept. 29, 1933)	$.96
Ilex, heavy (Sept. 29, 1933)	.90
Florence, Colo. (June 17, 1933)	.80
Fort Collins and Wellington, Colo. (June 17)	(See Salt Creek prices)
Big Muddy (Sept. 29, 1933)	1.01
Frannie, light (May 1, 1934)	.70
Frannie, heavy (Sept. 29, 1933)	.62
Salt Creek and LaBarge (Sept. 9, 1933)	See Stanolind Mid-Continent price schedule
Grass Creek, light (Sept. 29, 1933)	1.18
Grass Creek, heavy (Dec. 15, 1933)	.45
Elk Basin (Sept. 29, 1933)	1.18
Rock Creek (Sept. 29, 1933)	1.02
Dutton Creek (July 8, 1933)	See Mid-Continent gravity prices
Lance Creek (Dec. 16, 1932)	.92
Poison Spider (Mar. 5, 1931)	.70
Hudson (June 2, 1931)	.65
Lander (Mar. 5, 1931)	.40
Rex Lake (Feb. 22, 1930)	1.10
Osage	1.08
Lost Soldier (Sept. 30, 1933)	.88
Hamilton Dome:	
Below 18° (July 1, 1934)	.52
18° and above (July 1, 1934)	.62
Torchlight (Sept. 29, 1933)	1.18
Greybull (Sept. 29, 1933)	1.18
Pondera	1.15
Sunburst (Sept. 29, 1933)	1.35
Cat Creek, Montana	1.07
Hogback (Sept. 29, 1933)	1.11
Lea County, N. Mex. (Sept. 29, 1933)	.75
Maljamar (Sept. 29, 1933)	.70
Artesia-Jackson (Dec. 1, 1933)*	.75

Note—Salt Creek, Torchlight, Elk Basin Grass Creek, Frannie, Greybull, Hogback and Ilex by Stanolind Oil & Gas Co. Elk Basin, Grass Creek light, Big Muddy, Rock Creek and Sunburst by Ohio Oil Co. Lost Soldier posted by Producers & Refiners Corp. Artesia, Jackson and Maljamar posted by Continental Oil Co. Lea County, effective September 29, 1933, by Humble Oil & Refining Co. and other buyers; Fort Collins, Wellington, Orchard, Florence, Big Muddy, Cat Creek, Rattlesnake and Table Mesa by Continental Oil Co. Osage posted by Arro. Hamilton Dome, Wyo., by Stanolind Oil & Gas Co.

*Continental Oil Co.

North Louisiana and Arkansas

Smackover, Ark. (all grades)	$.70
Tullos, Urania, La. (Jan. 13, 1934)	.87
Nevada, Ark. (Sept. 29, 1933)	.60
East El Dorado (Sept. 29, 1933)	.70
Converse, La. (Mar. 17, 1934)	1.03
Elm Grove, La. (Sept. 29, 1933)	.75
Holly, La. (Nov. 17, 1934)	1.03
Pleasant Hill, La. (Mar. 17, 1934)	1.03
Zwolle, La. (Mar. 17, 1934)	1.03
Champagnolle, Ark. (Mar. 17, 1934)	.81
Lisbon, Ark. (Mar. 17, 1934)	1.03
Stephens, Ark. (Sept. 29, 1933)	.70
Urbana, Ark. (Mar. 17, 1934)	.60
Other fields	(See gravity table)

Note—Smackover: Effective September 29, 1933, Texas Co., Magnolia Petroleum Co., Standard of Louisiana, Louisiana Oil Refining Corp., Gulf Refining Co. and Phillips Petroleum Co. East El Dorado posted by Magnolia Petroleum Co. and Gulf Refining Co., Nevada by Standard Oil Co. of Louisiana, Urbana posted by H. L. Hunt, Inc., and Louisiana Oil Refining Co. Converse, Holly, Zwolle and Urbana by Standard Oil Co. of Louisiana; Elm Grove by Simmons Oil & Refining Co.; Pleasant Hill by Standard Oil Co. and Magnolia Petroleum Co.; Champagnolle by Standard Oil Co. and Lion Oil & Refining Co.

Eastern States

TIDE WATER PIPE CO.
(Effective Nov. 6, 1934)

Bradford, Pa.	$2.30
Allegany, N. Y.	2.30

SOUTH PENN OIL CO.
(Effective Nov. 6, 1934)

Pennsylvania Grade Oil in National Transit Lines (Bradford Field)	$2.30
Pennsylvania Grade Oil in Southwest Pennsylvania Lines	1.97
Pennsylvania Grade Oil in Eureka Pipe Line lines	1.93
Pennsylvania Grade Oil in Buckeye Pipe Line lines	1.83
Corning Grade Oil in Buckeye Pipe Line Co.'s lines (Oct. 2, 1933)	1.89

PENNZOIL CO.
(Effective Nov. 6, 1934)

Pennsylvania Grade Oil in National Transit Lines:	
Group A (Includes Cochran, Franklin, Hamilton and Doolittle districts.	$2.22
Group B (Includes Titusville district.	2.21
Group C (Includes Turkey and Tidioute districts.	2.20
Group D (Includes Bear Creek and Porkey districts.	2.19
Group E (Includes Eldeneau, Bull Creek, Rough Run, Carbon, Dipner, Bredin, McJunkin, Jameson, Kennerdell, Emlenton, Tiona, Lacey and Kinsua districts.	2.17

Price depends on length of pipe line haul to plant at Oil City.

PURE OIL CO.
(Effective Nov. 6, 1934)

Cabin Creek, W. Va.	$1.92
Bradford Hollow, W. Va.	1.92
Kelly Creek, W. Va.	1.92

CREW-LEVICK CO.

Oil City-Titusville	$2.25

Middle Western States

OHIO OIL CO.
(Effective September 29, 1933)

Lima	$1.30
Illinois (Jan. 5, 1934)	1.13
Princeton, Ind. (Jan. 5, 1934)	1.13
Plymouth	Shut in
Western Kentucky (May 24, 1934)	1.09
Midland, Mich. (Sept. 30, 1933)*	1.02
West Branch, Mich.	.84
Oceana, Mich. (Oct. 5, 1933)	.99
Somerset, Ky. (Sept. 30, 1933)	1.33

*Posted by Pure Oil Co. and Simrall Pipe Line Co. Producers Pipe Line Co. pays 5 cents per barrel over Pure Oil Co.'s posted prices. West Branch, Mich., posted by Simrall Pipe Line Co. Somerset, Ky., crude purchased by Ashland Refining Co., Ashland, Ky., and posted price includes premium. Oceana posted by Old Dutch Refining Co. and Naph-Sol Refining Co.

Canada

Ontario (September 9, 1933):	
Petrolia*	$2.10
Oil Springs	2.17
Turner Valley (May 21, 1934):†	
Clear naphtha	$2.55
Discolored naphtha	2.37
Crude oil, 50 gravity	2.19
Crude oil, 45 to 49.9	2.07
Crude oil, 40 to 44.9	1.50

*Imperial Oil, Ltd. †Imperial Oil, Ltd. and Regal Oil & Refining Co.

Mexico

Panuco*	$0.98

*F.o.b. ship, based on September transactions and exclusive of production and export taxes and bar dues.

California Crude Oil Prices

STANDARD OIL CO. OF CALIFORNIA
(Effective September 6, 1933)

For current purchases of crude oil at the well (unless otherwise specified). (All gravities above those quoted take highest price offered in that field.)

Gravity—	Long Beach	Seal Beach, Alamitos Heights	Huntington Beach	Inglewood	Playa del Rey	Olinda, Brea Canyon	Athens-Rosecrans	Torrance	Richfield	Whittier, La Habra	Montebello	Santa Fe Springs	La Habra-Coyote	Midway-Sunset, Elk Hills, Buena Vista Hills	Lost Hills	Coalinga	Coyote
14-14.9	$.65	$.65	$.65	$.65	$.65	$.65	....	$.65	$.65	$.65	$.65	....	$.65	$.57	$.57	$.57	$.65
15-15.9	.65	.65	.69	.69	.66	.69	....	.66	.65	.65	.65	....	.65	....	....	....	.65
16-16.9	.66	.65	.72	.73	.69	.73	....	.69	.67	.68	.65	....	.65	....	....	....	.65
17-17.9	.69	.65	.75	.76	.73	.76	....	.72	.70	.71	.65	....	.68	....	....	....	.68
18-18.9	.72	.65	.78	.80	.76	.79	....	.75	.74	.74	.65	....	.71	.61	.61	.59	.71
19-19.9	.75	.65	.81	.83	.80	.82	....	.78	.78	.78	.65	....	.74	.64	.65	.62	.74
20-20.9	.78	.68	.82	.87	.83	.85	....	.81	.82	.81	.66	....	.78	.67	.69	.65	.78
21-21.9	.81	.72	.86	.90	.87	.88	....	.83	.85	.84	.69	$.72	.81	.70	.73	.68	.81
22-22.9	.84	.76	.89	.94	.90	.92	....	.85	.89	.87	.72	.76	.84	.73	.76	.72	.84
23-23.9	.88	.81	.92	.97	.94	.95	$ .83	.89	.92	.90	.76	.79	.87	.77	.79	.75	.87
24-24.9	.91	.85	.95	1.01	.97	.98	.86	.92	.97	.93	.80	.83	.90	.81	.82	.78	.90
25-25.9	.94	.89	.98	....	1.00	1.01	.90	.96	1.00	...	.85	.87	.93	.85	.85	.81	.93
26-26.9	.97	.93	1.01	....	1.04	1.04	.94	.98	1.04	....	.89	.90	.96	.89	.88	....	.96
27-27.9	1.00	.98	1.04	....	....	1.07	.97	....	1.08	....	....	.94	.99	.93	.91	....	.99
28-28.9	1 03	1 02	1 07	....	....	1.10	1.01	....	1.11	....	....	.98	1.02	.97	.94	....	1.02
29-29.9	1.06	1.05	1.09	....	....	....	1 04	....	1.15	....	....	1.01	1.05	1.01	.97	....	1.06
30-30.9	1.09	1.10	1.12	....	....	....	1.08	....	....	....	....	1.05	1.09	1.05	1.00	....	1.09
31-31.9	....	....	....	....	....	....	1.12	....	....	....	....	1.08	1.12	1.09	....	....	1.12
32-32.9	....	....	....	....	....	....	1.15	....	....	....	....	1.12	1.15	1.13	....	....	1.15
33-33.9	....	....	....	....	....	....	....	....	....	....	....	1.16	1.18	1.17	....	....	1.18
34-34.9	....	....	....	....	....	....	....	....	....	....	....	1.19	1.21	....	....	....	1.21
35-35.9	....	....	....	....	....	....	....	....	....	....	....	1.23	....	....	....	....	....
36-36.9	....	....	....	....	....	....	....	....	....	....	....	1.26	....	....	....	....	....
37-37.9	....	....	....	....	....	....	....	....	....	....	....	1.30	....	....	....	....	....
38-38.9	....	....	....	....	....	....	....	....	....	....	....	1.34	....	....	....	....	....

Additional Standard Oil Quotations

Mountain View—Effective July 3, 1934, the following are the prices of the Standard Oil Co. of California for its current purchases of crude oil at the well in the Mountain View Field: 14 to 19.9 degrees, 57 cents; 20-20.9, 58 cents; 21-21.9, 59 cents; 22-22.9, 61 cents; 23-23.9, 62 cents; 24-24.9, 66 cents; 25-25.9, 69 cents; 26-26.9, 72 cents; 27-27.9, 75 cents; 28-28.9, 78 cents; 29-29.9, 81 cents; 30-30.9, 84 cents; 31-31.9, 87 cents; 32-32.9, 90 cents; 33 degrees and above, 93 cents.

Elwood Terrace—F.o.b. ship, 33 degrees, $1.03; 34 degrees, $1.06; 35-35.9, $1.09; 36-36.9, $1.12; 37 degrees and over, $1.15.

Newhall—14 degrees and over, 57 cents.

McKittrick and Kern River—14 degrees and over, 57 cents.

Wheeler Ridge—14 to 17.9 degrees, 57 cents; 18-18.9, 58 cents; 19 19.9, 61 cents; 20-20.9, 64 cents; 21-21.9, 67 cents; 22-22.9, 70 cents; 23-23.9, 73 cents; 24-24.9, 76 cents; 25 degrees and over, 79 cents.

Kettleman Hills—33-33.9 degrees, 93 cents; 34-34.9, 96 cents; 35-35.9, 99 cents; 36-36.9, $1.02; 37-37.9, $1.05; 38-38.9, $1.08; 39 degrees and over, $1.11.

The Texas Co. posted in Shiells Canyon, South Mountain and Santa Paula as follows: 14 to 17.9, 57 cents; 3 cents added for each degree up to and including 26-26.9 degrees at 84 cents; then 4 cents added for each degree up to and including 30 degrees and over at $1. Company posts Standard Oil Co.'s Montebello prices in Montebello and North Whittier, and posts Standard Oil Co. prices in Signal Hill, Alamitos Heights, Huntington Beach, Torrance, Richfield and Santa Fe Springs, all effective September 6.

General Petroleum Co. posts Standard Oil Co. prices in Athens, Rosecrans and Signal Hill; Alamitos Heights up to 26-26.9; Santa Fe Springs up to 35-35.9; Richfield up to 25-25.9; Brea Canyon and Olinda up to 25-25.9, and Torrance up to 25-25.9.

Union Oil Co., effective September 6, posts same price as Standard Oil Co. in all fields in which both purchase, excepting that in Athens-Rosecrans, Union Oil Co. posts 21-21.9, 72 cents, and 33-33.9, $1.18; 34-34.9, $1.21, and 35-35.9, $1.24.

Associated Oil Co., effective September 6, posted same prices for the same grades as Standard Oil Co. of California, excepting that in some fields its gravity scale stops as follows: Huntington Beach, 26 degrees and over; Seal Beach and Alamitos Heights, 36 degrees and over; Coyote Hills, 23 degrees and over; Richfield, 25 degrees and over; Torrance, 25 degrees and over; Inglewood, 24 degrees and over; Santa Fe Springs, 35 degrees and over; Midway-Sunset, Elk Hills, Buena Vista Hills, 30 degrees and over. Also Associated pays 52 cents for oil of 11 to 13.9 gravity in McKittrick, Kern Front, Kern River, Midway-Sunset, Elk Hills, Buena Vista Hills and Coalinga.

Saturated Sands in Two Sam Fordyce Outposts; Showings in Karnes and Bee Wildcat Tests

SAN ANTONIO, Tex., Nov. 12.—Coring saturated sand in two outpost tests in the Sam Fordyce Field, southwestern Hidalgo County, which if proved productive will extend the field about a mile east and 800 feet west, together with favorable showings being made by two wildcats in Karnes and Bee Counties, made a very interesting week in Southwest Texas.

On the east side of the Sam Fordyce Field, Danvers and Harrison's No. 1 Francisco B. Guerra in Tract 12, Porcion 41, is standing with casing cemented at 2,740 feet, after it had cored 6 feet of sand reported so highly saturated the operators decided a drill stem test was not necessary. The test is about 5,200 feet due east of the discovery, and will cause more locations. On the west side, about 800 feet from production, Kingwood Oil Co. and others' No. 1 David Flores in Tract 262, Porcion 38, tested considerable oil on a drill stem test, bottomed at a total depth of 2,780 feet. Tubing is being run and it will probably be brought in by the middle of the week.

Two other tests within the proven limits have reached the sand. Edward and Alford's No. 1 Eusebio Flores, in Tract 267, Porcion 38, about 1,000 feet west of the discovery, blew oil over the crown block on a nine-minute drill stem test, the best showing so far on any prospective producer in the field. It is bottomed at 2,807 feet and now running tubing. Moncrief and Showers' No. 1 John Lawrence, in the northwest 9.52 acres of the east 37.54 acres of Tract 274, Porcion 39, discovery tract, cored saturated sand from 2,772-84 feet, and casing was cemented without making a drill stem test. The field was further defined to the southeast, when Heep Oil Corp.'s No. 1 W. R. Jackson, in Tract 278, Porcion 40, about 3,000 feet southeast of the discovery, made a drill stem test from 2,777-80 feet and tested 3 fourbles of salt water with one joint of mud, and a trace of oil. It is reported it will be carried deeper. This is the third test to show salt water, the others being in the same direction from the discovery well, south of the Missouri Pacific Railway.

Heep Oil Corp.'s No. 1 Francisco B. Guerra, an interesting outpost test, in Tract 254, Porcion 40, about 4,000 feet northeast of the discovery, is drilling below 3,200 feet and is not encouraging. On a drill stem test made around 2,800 feet it tested nothing but gas, and has probably missed the regular pay horizon.

Lucky-Blocker and Bishop's No. 2 Francisco B. Guerra in Tract 254, Porcion 39, in the southeast 20 acres of the tract, drilling below 1,840 feet, should be the next test to reach the pay. Kingwood Oil Co.'s No. 3 Guerra, Tract 254, Porcion 39, 700 feet northeast of the discovery, is drilling below 1,070 feet, between the company's No. 2 Guerra and Lucky-Blocker and Bishop's No. 1 Guerra, both producers. Navarro Oil Co. has spudded No. 1 Seabury and others, in Tract 256, Porcion 38, about 1,800 feet northeast of the discovery.

New Possibility in Bee

The possibility of a new field in the northwestern part of Bee County was indicated during the week when the wildcat of Worth Oil Co., No. 1 Rutledge, about 2½ miles south of Caesar Field and a mile north of the old Grayburg area, began blowing gas and spraying an unestimated amount of oil when the operators attempted a drill stem test at 3,424 feet. It blew out through the drill pipe and ran wild for about two hours when it apparently bridged. Gravity is 29 degrees. This sand is believed to be in the Hockleyensis, the horizon in which the discovery well of the Grayburg area produced. That has been the only production in the Pettus district not in the Pettus sand.

Karnes County

Another wildcat in southern Karnes County cored the Pettus sand and on a 10-minute drill stem test from 3,305-14 feet tested 390 pounds of pressure and 9 feet of drilling mud which was cut with oil. The test was made through a one-quarter inch choke on bottom and a five-sixteenths inch choke on top. The operators were going in for another core and will make another drill stem test. California Oil Co.'s No. 1 J. C. Tom, Jr., a wildcat in the Maria De Jesus Y Barbo grant, ran an electrical coring test to 4,700 feet, which showed unfavorable indications and was abandoned.

West Tuleta

In the West Tuleta Field, Bee County, Mills Bennett Production Co.'s No. 1 Harris, which extended the field a half mile west last week, has been officially completed for an initial production of 196 bbls. daily, through a one-eighth inch choke, with tubing pressure 1,250 pounds and casing pressure 1,500 pounds. This company has contracted with the Shell Petroleum Corp. for the drilling of three wells on the latter company's 160-acre A. J. Silcock lease, and has rigged up for the first test. The same company is building derrick for No. 1 Tuleta Mercantile Co., in the SW Section 10, on acreage "farmed out" by the Gulf Production Co. Although no gauge has been taken, Whisenant and Trenchard's No. 2 Rapp, Section 10, has been completed estimated making around 200 bbls. per day on a one-quarter inch choke. It is bottomed at 3,900 feet. The same operators have made a deal with Tuleta Oil Co. for 40 acres in Section 10, east and offsetting their recent completion. The operators are to start a test within a few days to be carried as No. 1-B Rapp.

Starr County

In the Jeffries-Lambeth area, Starr County, interest was centered on Weekly Oil Corp.'s No. 2 Starr County Cattle Co. in Block 19, Jeffries-Lambeth Subdivision of Share 60-2, Porcion 89, Ancient Jurisdiction of Camargo. Good saturated sand was reported cored from 2,730-41 feet and the operators were preparing to make a drill stem test. If it makes a producer it will extend the area to the north. The county had one abandonment, and two locations the past week. The abandonment was Porter Evans' No. 1 Kelsey-Bass, a short distance north of State Highway 4 in Section 17, Porcions 75, 76, 77, Ancient Jurisdiction of Camargo, quit at 2,025 feet. One and a half miles east of production in the Jeffries-Lambeth area, Lester & Duffield, Inc., and others made location for No. 1 E. B. Carruth and others, in Share 1-B, Porciones 91-92, Ancient Jurisdiction of Camargo. The other new test was staked by Conway and Emanuel for No. 1 Starr County Cattle Co., in Block 62, Jeffries-Lambeth Subdivision of Porciones 88-89, Ancient Jurisdiction of Camargo, in the south central part of the county.

The Balcones fault zone received a disappointment when the wildcat test of Diamond Half Oil Co.'s No. 1 Maierhofer, which had been regarded as running high, cored the Edwards lime at 2,124-26 feet and showed no production. It will probably be drilled a little deeper and abandoned. Location is in the L. H. Peters Survey.

Webb County

The Bruni townsite area of the West Cole Field, Webb County, got its twelfth producer by O. W. Killam's No. 28 Bruni, located northeast of the townsite, completed for an initial production of 40 bbls. per hour from a total depth of 3,406 feet. Two other tests have reached the sand. American Liberty Oil Co.'s No. 6-A Bruni, in Survey No. 6, and Herman Brown's No. 3 Bruni. No. 6-A Bruni topped the sand at 3,403-09 feet and is standing with casing cemented at 3,387 feet. Total depth is 3,414 feet. Herman Brown's No. 3 Bruni Estate topped the sand at 3,408-32 feet, and is waiting on cement to set. Total depth is 3,432 feet.

Willacy and Cameron

Since the discovery of the Sam Fordyce Field, southwestern Hidalgo County, the adjoining counties of Willacy and Cameron have received quite an active lease play, and several large blocks are being taken. In Willacy County, Shell Petroleum Corp. has taken a five-year lease on the 5,950-acre Yturria Land & Livestock Co. land. The cash consideration was reported to have been $12,000. Over the line in Cameron County, Magnolia Petroleum Co. has completed a large drilling block in the Harligen area and will drill a 4,500-foot test. Shell Petroleum Corp. is also reported to have taken a drilling block in the same area.

Wildcat Operations in Southwest Texas

Week Ending November 10

BANDERA COUNTY

P. Crane & Co.'s No. 1 Watson, 988 ft. NE line, 926 ft. SE line, Sec. 71, Antonio Curvier Sur.
T.D. 1,790 ft.

Plateau Oil Co.'s No. 1, Garrison Sur. No. 606, 1,500 ft. from N and 2,700 ft. from E lines of Sur. (8 mi. SW of Medina).
No report.

Muenrio Oil Co.'s No. 1 E. M. Pruitt, 2,418 ft. from NE line, 330 ft. from SE line of J. A. Navarro Sur.
Drlg. 1,300 ft.

BASTROP COUNTY

Champion et al's No. 1 Charles E. Anderson, Antonio Navarro Sur.
Standing 850 ft.

BEE COUNTY

Cecil Hagan's No. 1 John R. Scott, 1½ mi. NE of Morgan test.
Location.

R. M. Herod's No. 5 Kimball, 810 ft. from E line, 150 ft. from N line of 110-ac. tract in S. Winship Sur.
Derrick.

Bill Hindeman's No. 1 Imogene Hall, 2,310 ft. along NW line of S½ of H. W. Fontaine Sur., thence at R/A 1,262 ft.
Location.

Wm. F. Morgan et al's No. 1 Hicks & Hall, Sec. 43 (Normanna area).
Sand 3,628-38 ft.; setting csg. 3,628 ft.

Humble O. & R. Co.'s No. 1 Daniel Fox, 1,500 ft. from N line, 3,370 ft. from E line of 1,584-ac. tract in M. Fox Sur.
Sand 4,780-97 ft.; showed 130 ft. of oil and mud in 15 min.; drlg. ahead.

Mid-Continent Crude Oil Co.'s No. 2 Kimball (Grayburg area).
T.D. 250 ft.; S.D.

R. J. Worthington et al's No. 1 Rutledge, 1,000 ft. from N line and 200 ft. from E line of A. Hadley Sur.
Drlg. 3,000 ft.

BEXAR COUNTY

Lloyd Bender's No. 1 Evans, 1,200 ft. from W line, 200 ft. from N line of 319.7-ac. tract in de la Garza Sur.
Standing 979 ft.

F. T. Chew's No. 1 C. S. Ogden & Brooks, 50 ft. E line, 3,500 ft. from Mitchell Lake, on 1,500-ac. tract, Irrigated farms.
S.D. 350 ft.

Dr. Dickens' No. 1 Victor Golla, 150 ft. NW line and 150 ft. NE line of Cardines No. 25 Sur.
S.D. 530 ft.; set csg.

Jones & Kieffer's No. 1 LaGrane, NW cor. of tract, 210 ft. each way, F. Rolen Sur.
Spudded.

McFee & Briggs' No. 1 Lamb, 9,200 ft. from S line, 300 ft. W line, Manvel Deluna Sur. No. 3, Tract A. & B.
S.D. 1,065 ft.

Geo. O'Neill et al's No. 1 Salek Cherniarsky, E of Eckert Field.
Spudded.

Ricker, Auld & Bonner's No. 1 French Estate, S of C Sec., on 1,000-ac. tract.
Drlg. 1,260 ft.

R. Y. Walker's No. 1 L. A. Hamilton, 550 ft. SE and NW cor, 1,110 ft. NE of NW line of tract, Blk. 4,007.
Location.

BROOKS COUNTY

Cole Pet. Co.'s No. 1 Ulrich, 785 ft. E line, 1,323 ft. S line of C.C.S.D.&R.G.N.G. Sur. 7. Abd. 4,514 ft.

Helmerich & Payne's No. 1 Scott and Hooper, Palo Alto y Guerra grant.
Location.

CALDWELL COUNTY

Anderson's No. 1 Perry, 330 ft. SE and NE lines of 27-ac. tract, Giddeon Pace Sur.
T.D. 1,901 ft.; standing.

O. Dawn's No. 1 F. Tiller, 250 ft. from N line, 1,000 ft. from E line of 37-ac. tract, in G. Hinds Sur.
Drlg. shale 460 ft.

Fomax Oil Co.'s No. 1 B. G. Tiller, 500 ft. from N line, 150 ft. from W line of tract in G. Hinds Sur.
Derrick.

F. P. Hynes et al's No. 1 Tramwell, 750 ft. from SE line and 330 ft. from NE line of tract in Ester Berry Sur.
No report.

Kurz Oil Co.'s No. 1 Kurz ranch fee, 4,000 ft. SW line and 4,300 ft. SE line of Barnard Kiekant Sur.
T.D. 3,615 ft.; S.D.

F. Meyers' No. 1 Mooney, 260 ft. from road, 380 ft. from middle of SE cor. of 102-ac. tract, Seale Sur.
Moving in rig.

Stanley Smith's No. 1 J. C. Copeland, about 4 miles SW of Lockhart and beyond the Mebana Estate.
Setting up machinery.

DUVAL COUNTY

Conway & Buescher's No. 2 Hoffman, 330 ft. NE and SE lines of Sur. 119.
Spudded in and standing.

Grimes et al's No. 1 Fitzsimmons, 300 ft. S line and 150 ft. E line, Sur. 291.
Cmtd. surface csg. 50 ft.; standing.

W. C. McBride's No. 1-A Hagist, 330 ft. from N and E lines of Blk. 2, Sec. 265.
Spudded in.

Mills Bennett Prod. Co.'s No. 1 D.C.R.C., 150 ft. N, 4,200 ft. E line of Sur. 192.
Standing 1,685 ft.

Stieren Oil Co.'s No. 1 J. P. Philp, 1,650 ft. S line, 990 ft. E line, Sur. 320.
Drlg. 1,705 ft.

W. B. Stewart's No. 1 Juan Benavides, 3,752 ft. S of the most southerly N line and 330 ft. from SW line of Sur. 355.
Drlg. 3,350 ft.

Texas Co.'s No. 1 Tom Graham, 5,065 ft. N 65 deg. E and 1,130 ft. S 25 deg. E, W cor. Geo. Reynolds Sur. 572.
T.D. 5,410 ft.; fishing 4,112 ft.

EDWARDS COUNTY

Carter et al's No. 1 W. A. Miers, 990 ft. from N and E lines of Sec. 6, C.C.S.D.& R.G.N.G. Sur.
S.D. 402 ft.

Will Olhausen's No. 1-B Turney, 660 ft. from W line, 1,622 ft. from N line of Sec. 176, C.C.S.D.&R.G.N.G. Sur.
Drlg. 585 ft.; no report.

H. H. Sides' No. 1 Turney, C.C.S.D.&R.G.N.G. Sur. No. 164, 1,320 ft. N line and W line of survey.
Standing 1,610 ft.

Harry Adams' No. 1 Holman, 1,650 ft. N line, 330 ft. from E line, Sec. 22, C.C.S.D. &R.G.N.G. Sur.
T.D. 583 ft.; in sand at 575-82 ft.; showing for about 1 bbl. daily of dead oil; no report.

FAYETTE COUNTY

Texas Seaboard Oil Co.'s (J. Elmer Thomas and Henshaw Bros.') No. 1 Gliecker, 330 ft SW and SE of N cor. of 98.5-ac. tract in Anna Powell League.
T.D. 4,000 ft.; abd.

FRIO COUNTY

Amerada Pet. Co.'s No. 2 Halff & Oppenheimer, begin at most easterly N cor. of John E. Gibson Sur. No. 16, thence SE along NE line of Sur. 2,100 ft., thence SW at right angles 800 ft. (4 mi. SW of Pearsall).
Drlg. 9,935 ft.

GILLESPIE COUNTY

Ed L. Nixon's No. 3 Lindig, 12,694 ft. S line, 1,323 ft. W line, Maria Josepha Guerra Sur. No. 41, or 6 ft. S of No. 1.
Fishing 516 ft.

(Continued on Page 142)

Andrews County Pool Opener Sure Producer; Deep Test Scheduled for Lynn County Area

By L. E. BREDBERG

Fort Worth Bureau, The Oil and Gas Journal

FORT WORTH, Tex., Nov. 12.—Honolulu Oil Co. and Llano Oil Co.'s No. 1 J. E. Parker, in Section 7, Block A-44, P.S.L. Survey, 5 miles southeast of the Deep Rock Pool, mentioned last week as another probable pool opener for Andrews County, in West Texas, is still drilling. It is down 4,730 feet with 3,600 feet of oil in the hole and is sure of making some kind of a producer. Elevation is 3,194 feet. No water has yet appeared in the test, which is now nearly 500 feet in the white lime section, with bottom of the hole 1,636 feet below sea level.

Humble Oil & Refining Co.'s No. 1 Walker, 3 miles west of the Parker test, in Section 6, Block A-43, is drilling at 4,450 feet, and should be the next Andrews' County test to log the oil horizon if it also proves a producer. It carried a slight odor of oil when drilling at 4,389 feet. It may prove a connecting link between the Fuhrman producers to the southwest and the Parker well to the east.

Bond and others' No. 1 McCarley, 7 miles east and 1½ miles south of the Parker test, is also an important test. It is down 4,300 feet. It is in Section 39, Block 3.

Humble Oil & Refining Co.'s No. 2 Means, in Section 6, Block A-19, east of the same company's discovery in the northeast part of Andrews County, is preparing to pump after plugging back from 4,623 to 4,562 feet to shut off sulphur water. It is not expected to make much of a well. The company's No. 1 J. S. Means, a quarter of a mile to the south of the discovery, in Section 2, Block A-35, is drilling plug at 4,112 feet in gray lime after cementing 7-inch casing at that depth. The lime was reported topped at 4,085 feet. The outcome is important for this area, about 16 miles northeast of the Deep Rock Pool, the first discovered production in the county. The company holds a large block of leases around the discovery, which also was a small one. If this third test does not prove any larger further drilling cannot be expected at present.

Landreth Production Co. and Humble Oil & Refining Co. have plugged back No. 1 Clarence Scharbauer, in Section 20, Block 44, Township 1n, T.&P. Survey, from 4,236 to 4,211 feet and intend plugging back further in an effort to shut off sulphur water. It is destined to make a small producer, opening another pool in northwest Ector County, and may possibly connect with another small producer 5½ miles northwest. The companies are planning to drill a second test, possibly to the northwest, and in line with the Cummins discovery.

Deep Test in Lynn County

The extreme northern part of the West Texas district is to get a deep test. Lynn County, which has no production, has never had a lease and royalty "play" and has been tested by the wildcatter in but few areas. Wanette Oil Co. of Dallas, headed by E. B. (Gene) Germany, has contracted to drill a 5,000-foot test on the C. O. Edwards lands, in Section 29, L.&S.V. Survey. E. T. Hart of Fort Worth and associates hold the 10,000-acre block around the location which they staked about 7½ miles southwest of Tahoka.

New Wildcats

Merry Brothers and Perrini have staked location for a wildcat in Section 20, Block 30, W.&N.W. Survey, Sterling County; a wildcat location has been staked in Fisher County, two in Jones County and World Oil Co. is drilling in the McDowell area of northern Glasscock County, where it brought in a small discovery well five years ago. Sayre Oil Co. has staked location for No. 2 Howe, offsetting its discovery well east of the north end of the Hendrick Pool in Winkler County, in Section 12, Block 26. Skelly Oil Co. has also staked location for No. 2 Halley, northwest of the discovery completed by the company a couple of weeks ago. These two areas are on a north-south trend, the well producing from a sand section not found in the Hendrick Field, about 3 to 4 miles to the west.

Several tests drilling on leases located in the trend, and between the two discoveries, will be closely watched when they reach the depth where the sand horizon is expected. The two discoveries have revived interest in this country.

Sid Richardson's No. 1 Halley, in Section 18, Block B-11, to the northwest of the Halley discovery well, is drilling below 3,385 feet in lime, carrying 2,000 feet of sulphur water and making about 20 bbls. of oil daily, flowing by heads. It apparently is on the east edge of the sand zone.

Twelve Completions

There were 12 tests completed in the West Texas district during the week, all producers but two, one of which was a northwest edge test of the McMillan Pool in Runnels County and the other a dry hole in the Hayzlett or Grand Falls area of southern Ward County. Big Lake Oil Co.'s No. 14-C University, Ordovician test in the Big Lake Field, Reagan County, proved a good well after shooting with 180 quarts when treating twice, first with 1,000 gallons of acid and later with 2,000 gallons. It made an initial production of 1,060 bbls. the first 24 hours, settling to 965 bbls. per day. Before shooting and treating it was good for only about 85 bbls. Total depth was 8,482 feet, but it was plugged back to 8,416 feet before shooting and treating.

There were 12 locations staked in the district during the week, the majority in producing areas. A test will be drilled in the vicinity of Shafter Lake, several miles north of the Deep Rock Pool, in northern Andrews County, but no location has been staked. The old lake bed is in the western part of Block A-36, P. S.L. Survey, and in Block 14, University lands.

WICHITA FALLS DISTRICT

There were 44 tests completed in the Wichita Falls district during the week, 15 of which were dry and abandoned. Locations were staked for 46 tests in the district, which is becoming more active all the time. One of the most important completions was Fain and McGaha's J. G. Thompson, in Section 44, Block 18, H.&T.C. Survey, in the Thalia area of Foard County. It was completed for an initial production of only 7 bbls. per day after treating with 1,000 gallons of acid, but proves an opener of a new pay horizon in this county. This new pay was topped at 2,074 feet, the hole was bottomed at 2,086 feet, but it was plugged back to 2,085 feet before treating and completing. Other tests are expected to be drilled on surrounding acreage.

Production in the district averaged 60,430 bbls. per day during the week, a drop of 530 bbls. under the previous week.

PANHANDLE DISTRICT

There were 11 locations staked in the Panhandle district. One was reported for the U. S. Bureau of Mines in Potter County, and will probably be drilled for geological data as well as for underlying minerals. This will be the first test for Potter County in a long time.

There were 10 completions, 1 a small gasser and another making only from 5 to 10 bbls. of oil per day with 1,000,000 feet of gas. All the completions were in Gray and Wheeler Counties. Only about 2,700 bbls. of new production was added to the daily potential.

The new discovery of the Humble Oil & Refining Co., on the Logan lands in the Pedigo Survey, Hutchinson County, remains untested. It was plugged back from 3,296 feet to shut off water and shoot. A 500-foot liner was set on bottom of the hole and it is being swabbed above the liner. Amtex Oil Co.'s No. 1 Stevenson, in Section 7, Block M-24, T. C. Survey, between the Logan discovery and the Stinnett production, 7 miles to the south, is drilling. At 3,295 feet it had 1,000 feet of fluid in the hole and when pumped it pumped only 10 bbls. and pumped off. Both tests are looking less encouraging.

Wildcat Operations in West Texas

Week Ended November 12

ANDREWS COUNTY

R. S. Bond et al's No. 1 McCarley, 1,320 ft. from N and W, Sec. 39, Blk. 3, P.S.L. Sur.
Drlg. 4,310 ft.

Honolulu and Llano Oil Co.'s No. 1 J. E. Parker, 1,320 ft. from S line and 1,470 ft. from W line of Sec. 7, Blk. A-44, P.S.L. Sur.
Drlg. 4,675 ft.; oil at 4,619 and 4,650 ft.

Humble Oil & Ref. Co.'s No. 1 B. S. Walker, 660 ft. from E line and 660 ft. from S line of Sec. 6, Blk. A-43, P.S.L. Sur.
Drlg. 4,385 ft.; show oil 4,340 ft.

Humble Oil & Ref. Co.'s No. 2 Means, 1,980 ft. from S and 1,487 ft. from W. Sec. 6, Blk. A-19.
T.D. 4,623 ft.; P.B. to 4,562 ft.; installing pumping equipment.

Humble Oil & Ref. Co.'s No. 2 Means, 660 ft. from N and 1,980 ft. from W, Sec. 11, Blk. A-35.
Derrick.

BORDEN COUNTY

Moore Bros.' No. 1 Clayton & Johnson, 1,320 ft. N and E, Sec. 29, Blk. 32, Twp. 4n, T.&P. Sur.
Location.

BREWSTER COUNTY

Joiner et al's No. 1 McIntyre, 353 ft. from S, 2,390 ft. from E of Sec. 31, Blk. 352, W. M. Mitchell Sur.
S. D. 2,100 ft.

King & Franklin's No. 1 Gage Est., C Sec. 133, Blk. 22, G.H.&S.A. Sur.
S.D. 341 ft.

COCHRAN COUNTY

Kelsey's No. 1 Slaughter, C Labour 36, League 150, R.C.S. Lands.
Location.

West Texas Development Co.'s No. 1 Slaughter, C of Labour 53, League 159, Randall Co. School Lands.
Derrick.

COKE COUNTY

Wm. Hooper's No. 1 Gaston, 340 ft. from S line and 654 ft. from W line of Joseph Sur. No. 11.
S.D. 2,560 ft.

CRANE COUNTY

Continental Oil Co.'s No. 1 M. Dawson, 1,320 ft. from N and 440 ft. from E, Sec. 50, Blk. X.
T.D. 2,476 ft.; testing.

Loffland Bros. et al's No. 1 Tubbs.
T.D. 4,510 ft.

Strauss' No. 1 Phelps et al, 2,113 ft. from N and 713 ft. from NW Sec. 13, Blk. 31, H.&T.C. Sur.
Waiting on casing.

CULBERSON COUNTY

Anderson-Pritchard Oil Corp., Magnolia Pet. Co. et al's No. 1 Borders, 1,255 ft. N and 2,305 ft. from W, Sec. 34, Blk. 69, P.S.L. Sur.
S.D. 424 ft.

Miller Bros.' No. 1 fee, 1,900 ft. from N and 660 ft. from E line of Sec. 21, Blk. 97, P.S.L. Sur.
Drlg. 2,020 ft.

Wood et al's No. 1 Hall, 250 ft. from S and 85 ft. from E, Sec. 11, Blk. 54½, 16 miles N of Van Horn, P.S.L. Sur.
S.D. 246 ft.

DAWSON COUNTY

Ray Albaugh et al's No. 1 John Robinson 1,320 ft. from N line, 1,320 ft. from W line of Sec. 46, Blk. M, E.L.R.R. Sur.
S.D. 3,300 ft.

ECTOR COUNTY

Black et al's No. 1 Connell, 330 ft. from S and 2,310 ft. from W, Sec. 1, Blk. B-16, P.S.L. Sur.
Set csg. 3,335 ft.

Harrison et al's No. 3 Addis, 1,650 ft. from N line and 2,200 ft. from W line of Sec. 25, Blk. 43, Twp. 2s. T.&P. Sur.
Underreaming csg. 1,273 ft.

Landreth Prod. Co.'s No. 1 Johnson, 440 ft. from N and W, Sec. 47, Blk. 42, Twp. 1s. T.&P. Sur.
Drlg. 1,425 ft.

Landreth Prod. Co.'s No. 1 Clarence Scherbauer, 660 ft. from S and E. lines of Sec. 20, Blk. 44, Twp. 1n, T.&P. Sur.
S.D. 4,236 ft.; P.B. 4,211 ft.; to P.B. further.

Stanolind Oil & Gas Co.'s No. 3 J. M. Cowden, 440 ft. from S line and 440 ft. from W line, Sec. 34, Blk. 43, Twp. 1n.
S.D. 230 ft.

Sunray & Llano's No. 2 Jones, 2,310 ft. from N and E, Sec. 6, Blk. 44, Twp. 3s.
Drlg. 665 ft.

EDWARDS COUNTY

Harry Adams' No. 1 Holman, 1,650 ft. from N and 330 ft. from E, Sec. 22, G.C.S.D. &R.G.N.G. Sur.
S.D. 540 ft.; show oil 520-25 ft.

(Continued on Page 140)

WEST TEXAS COMPLETIONS

Fisher County

Texas Co.'s No. 2 Daniels, top pay 3,108 feet, total depth 3,111 feet, initial production 2,760 bbls. per day pumping, with 1,560 bbls. of water.

Glasscock County

Continental Oil Co.'s No. 6 Phillips, top pay 2,219 feet, total depth 2,375 feet, initial production 25 bbls. the first hour.

Pecos County

Broun & Collett's No. 17 Tippett, top pay 449 feet, total depth 486 feet, initial production 60 bbls. California Co.'s No. 24 Yates, top pay 1,295 feet, total depth 1,315 feet, initial production 31,660 bbls. Phil Broun's No. 6 Tippett, top pay 494 feet, total depth 698 feet, initial production 17 bbls.

Reagan County

Big Lake Oil Co.'s No. 14-C University, total depth 8,482 feet, plugged back to 8,416 feet, shot with 180 quarts from 8,376-8,416 feet, acidized with 1,000 gallons, then given a 2,000-gallon treatment, initial production the first 24 hours 1,060 bbls., settled to 965 bbls.

Runnels County

Agnew Oil Co.'s No. 1 Wade, dry and abandoned 2,573 feet. Petroleum Interests' No. 2-A Brevard and Dibble, top pay 1,493 feet, total depth 2,507 feet, initial production 50 bbls.

Upton County

Perry & Breeding's No. 1 Lane, top pay 2,310 feet, total depth 2,357 feet, initial production 163 bbls.

Ward County

Richardson's No. 1 Hayzlett, dry and abandoned 3,120 feet; No. 1 Johnson,

top pay 2,360 feet, total depth 2,550 feet, initial production 779 bbls. Caprito's No. 8 Bennett, top pay 2,310 feet, total depth 2,537 feet, initial production 458 bbls.

WICHITA FALLS COMPLETIONS

Foard County

Fain & McGaha's No. 1 Thompson, top pay 2,074 feet, total depth 2,085 feet, initial production 7 bbls.

Archer County

Perkins & Cullum's No. 73 Falls County, top pay 1,149 feet, total depth 1,162 feet, initial production 300 bbls.; No. 111 Falls County, top pay 1,126 feet, total depth 1,150 feet, initial production 75 bbls.; No. 112 Falls County, top pay 1,119 feet, total depth 1,139 feet, initial production 120 bbls.; No. 114 Falls County, top pay 1,114 feet, total depth 1,124 feet, initial production 100 bbls.; Donoho & Hayes' No. 2 Ward Brothers, dry and abandoned 1,013 feet. Cockburn's No. 5 Andrews, top pay 1,384 feet, total depth 1,395 feet, initial production 100 bbls. per hour; No. 3 Andrews, top pay 1,388 feet, total depth 1,399 feet, initial production 8 bbls. per hour; No. 4 Andrews, top pay 1,375 feet, total depth 1,376 feet, initial production 700 bbls. Burns' No. 1 Stephen-Rooch Co., dry and abandoned 1,203 feet. Bridwell and Texas Co.'s No. 3 Oil Investment Co., top pay 1,207 feet, total depth 1,210 feet, initial production 24 bbls. Bridwell Oil Co.'s No. 29-B Oil Investment Co., dry and abandoned 1,450 feet. Bridwell Oil Co. and Continental Oil Co.'s No. 13 Logan, top pay 1,155 feet, total depth 1,172 feet, initial production 10 bbls. Bonner Oil Co.'s No. 3-B Abercrombie, top pay 1,168 feet, total depth 1,187 feet, initial production 8 bbls. Fain & McGaha's No. 22 Arnold, top pay 1,161 feet, total depth 1,175 feet, initial production 200 bbls.; No. 23 Arnold, top pay 1,166 feet, total depth 1,181 feet, initial production 50 bbls.; No. 23-C Ferguson, dry and abandoned 661 feet. Hamer's No. 8 Longley, top pay 951 feet, total depth 937 feet, initial production 150 bbls. King Royalty Co.'s No. 2-B Abercrombie, top pay 1,186 feet, total depth 1,197 feet, initial production 22 bbls. Hammond Oil Co.'s No. 7 Abercrombie, top pay 1,169 feet, total depth 1,180 feet, initial production 15 bbls. Kleiner's No. 9 Andrews, top pay 872 feet, total depth 880 feet, initial production 75 bbls.; No. 10 Andrews, top pay 964 feet, total depth 973 feet, initial production 100 bbls. McLaughlin Brothers' No. 3 Barret, top pay 600 feet, total depth 665 feet, initial production 20 bbls. Pace's No. 13 Abercrombie, top pay 1,159 feet, total depth 1,162 feet, initial production 50 bbls. Rounds' No. 1 Benson, dry and abandoned 1,004 feet.

Jack County

Brazos River Gas Co.'s No. 1 Moore, top pay 2,910 feet, total depth 2,937 feet, initial production 30 bbls. Deskins' No. 1 Mower, dry and abandoned 600 feet.

Montague County

Bridwell Oil Co.'s No. 3 Gist, top pay 1,211 feet, total depth 1,218 feet, initial production 30 bbls.

Wichita County

Burns & Long's No. 6-D Allen & Kemp, top pay 1,636 feet, total depth 1,645 feet, initial production 75 bbls.; No. 7-D Allen & Kemp, top pay 208 feet, total depth 226 feet, initial production 10 bbls.; No. 8-D Allen & Kemp, top pay 465 feet, total depth 472 feet, initial production 25 bbls. Golding & Cochran's No. 8-C Waggoner Brothers, top pay 594 feet, total depth 598 feet, initial production 10 bbls. King Royalty Co.'s No. 3-H Waggoner, top pay 1,547 feet, total depth 1,549 feet, initial production 120 bbls. Petroleum Producers Co.'s No. 52 Allen & Kemp, dry and abandoned 475 feet. Burns & Long's No. 10-D Allen & Kemp, top pay 211 feet, total depth 225 feet, initial production 10 bbls.

Wilbarger County

Webb & Stilley's No. 1-B Waggoner, dry and abandoned 2,098 feet.

Young County

Black Gold Producing Co.'s No. 1 Kirkland, dry and abandoned 670 feet. Knight Oil Corp. and others' No. 1 Andrews, top pay 912 feet, total depth 945 feet, initial production 2 bbls. Kriss' No. 1 Clarida, dry and abandoned 603 feet. Long's No. 1 Stowe, dry and abandoned 1,083 feet. Pace, Art & Parrott's No. 3 Montgomery, dry and abandoned 509 feet. Willis' No. 1 Casey, dry and abandoned 630 feet; No. 1 Bullock, dry and abandoned 401 feet. Wooten & Reed's No. 1 Boyd, dry and abandoned 883 feet.

PANHANDLE COMPLETIONS

Gray County

Humble Oil & Refining Co.'s No. 2 Palmer, top pay 3,020 feet, total depth 3,070 feet, initial production 340 bbls. Kewanee Oil & Gas Co.'s No. 5 Arnold, top pay 3,198 feet, total depth 3,258 feet, initial production 660 bbls. Sinclair Prairie Oil Co.'s No. 1 Smith, top pay 3,185 feet, total depth 3,283 feet, initial production 475 bbls. Smith Brothers' No. 2 Bailery, abandoned location. Stanolind Oil & Gas Co.'s No. 2 Hood, top pay 2,920 feet, total depth 3,042 feet, initial production 174 bbls. St. Clair's No. 1 Bailey, gas pay 2,312 feet, total depth 2,920 feet, initial production 5 to 10 bbls. oil and 1,000,000 feet of gas.

Wheeler County

Alma Oil Co.'s No. 6 Johnson, top pay 2,410 feet, total depth 2,451 feet, initial production 416 bbls. Pendleton & Vaught's No. 1 Simms, total depth 2,185 feet, initial production 1,000,000 feet of gas. Horner & Rogers' No. 1 Plummer, top pay 2,450 feet, total depth 2,461 feet, initial production 184 bbls. Piney Oil & Gas Co.'s No. 2-B Koons, total depth 2,324 feet, plugged back to 2,314 feet, initial production 30 bbls. per day pumping. Shell Petroleum Corp.'s No. 4 D'Spain, top pay 2,420 feet, total depth 2,500 feet, initial production 673 bbls.

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RETAIL PRICE CHANGES

(Continued from Page 58)

and station gasoline 1 cent in Bristol. October 11, reduced station gasoline .5 cent in Shreveport; October 13, reduced tank wagon gasoline 1 cent and station gasoline .5 cent; October 25, reduced tank wagon and station gasoline 1 cent; October 31, advanced tank wagon gasoline 4.5 cents and station gasoline 5.5 cents.

Standard Oil Co. of Kentucky, October 24, reduced tank wagon gasoline 2 cents and station gasoline 3 cents in Lexington; October 25, reduced station gasoline 1 cent; October 26, reduced tank wagon gasoline 2 cents and station gasoline 1 cent. October 24, reduced tank wagon gasoline 2.5 cents and station gasoline 4.5 cents in Louisville; October 26, reduced tank wagon gasoline 1 cent. October 20, reduced tank wagon and station gasoline 1.5 cents in Paducah; October 21, reduced tank wagon gasoline .5 cent and station gasoline 1.5 cents; October 22, reduced tank wagon and station gasoline 1 cent; October 23, reduced station gasoline .5 cent; October 26, reduced tank wagon gasoline .5 cent. October 24, reduced tank wagon and station gasoline 1 cent in Jackson. October 16, advanced tank wagon and station gasoline 2.5 cents in Vicksburg; October 24, reduced tank wagon and station gasoline .5 cent; October 25, reduced them .5 cent further; October 27, reduced them .5 cent further. October 28, reduced them .5 cent further; October 29, advanced tank wagon gasoline .5 cent. October 24, advanced tank wagon and station gasoline 1 cent in Birmingham. October 24, reduced tank wagon and station gasoline 2.5 cents in Mobile; October 26, reduced tank wagon and station gasoline 1.5 cents; October 27, reduced station gasoline 1 cent; October 28, reduced tank wagon and station gasoline .5 cent. October 24, reduced tank wagon and station gasoline 1.5 cents in Montgomery; October 25, reduced them 1.5 cents further; October 26, reduced station gasoline 2 cents; October 27, reduced tank wagon gasoline 1.5 cents and station gasoline .5 cent; October 29, reduced tank wagon and station gasoline .5 cent. October 20, reduced tank wagon gasoline 1.5 cents and station gasoline 2.5 cents in Atlanta. October 21, reduced station gasoline 1 cent; October 23, reduced tank wagon gasoline 1.5 cents and station gasoline 2.5 cents; October 29, reduced tank wagon gasoline 1 cent; October 30, reduced tank wagon and station gasoline .5 cent. October 20, reduced tank wagon and station gasoline 2.5 cents in Augusta; October 21, reduced station gasoline 1.5 cents; October 22, reduced tank wagon gasoline .5 cent and station gasoline 1 cent; October 23, reduced tank wagon and station gasoline .5 cent; October 29, reduced tank wagon gasoline 1 cent. October 20, reduced tank wagon and station gasoline 2.5 cents in Macon; October 21, reduced station gasoline 1.5 cents; October 22, reduced station gasoline .5 cent; October 23, reduced tank wagon and station gasoline .5 cent; October 29, reduced tank wagon gasoline 1 cent. October 24, reduced tank wagon and station gasoline 2 cents. October 24, advanced tank wagon and station gasoline 1 cent in Pensacola; October 26, reduced tank wagon gasoline .5 cent and station gasoline 1.5 cents; October 27, reduced tank wagon and station gasoline 1 cent; October 29, reduced tank wagon and station gasoline 2 cents. October 30, advanced tank wagon kerosene 3 cents in Birmingham.

Standard Oil Co. of New Jersey, October 31, reduced tank wagon and station gasoline .5 cent in Washington. October 31, reduced tank wagon and station gasoline .7 cent in Danville.

Standard Oil Co. of Nebraska, October 26, reduced station gasoline .4 cent in McCook. October 31, reduced tank wagon kerosene 2 cents in North Platte.

Standard Oil Co. of California, November 3, reduced tank wagon and station gasoline 3 cents in Phoenix.

Magnolia Petroleum Co., October 31, reduced tank wagon and station gasoline 1.5 cents in El Paso. October 31, advanced tank wagon and station gasoline 2 cents in Texarkana.

November 8, reduced tank wagon and station gasoline 5 cents in Dallas. November 11, reduced tank wagon and station gasoline 4 cents in Fort Worth. November 9, reduced tank wagon and station gasoline 3 cents in Houston. November 12, advanced tank wagon and station gasoline 1 cent in Fort Smith. November 12, advanced tank wagon gasoline 3.5 cents and station gasoline 4.5 cents in Little Rock.

Four More East Texas Areas Eliminated by Tests; Pressures Bolstered by Cut in Production

By L. E. BREDBERG

DALLAS, Tex., Nov. 12.—Four more areas were "rubbed" off the possible producing list in East Texas during the week when as many wildcat tests were reported dry and abandoned. The northeast Freestone County test of Goldston was abandoned at a total depth of 4,129 feet after topping the Woodbine section at 4,048 feet and the sand at 4,113 feet. Hill and Hill's No. 1 Jones in Hunt County was shut down at 4,760 feet to plug. The Rains County test of Rio Oil Co. on the Easter lands, was also given up, total depth 4,353 feet. The deepest test abandoned during the week was the Wood County test of Snyder, Alex and others on the Holmes tract. It went to 5,330 feet. A shallow test in Navarro County was drilled to 802 feet without success.

New Wildcats

Another wildcat due for abandonment is Jameson and others' No. 1 Mullineaux, in the T. M. Garrett Survey, 5 miles northwest of Maydell, in Cherokee County. It is shut down at 4,732 feet for plugging.

Another test coring deep without any showings of oil or gas is Fidelity Oil & Royalty Co.'s No. 1 Holcomb, in the Z. Gibbs Survey, in southern Cherokee County. It is down to 5,160 feet in red beds and sandy shale, showing no encouragement.

E. L. Smith Oil Co.'s No. 1 Heimple, in the A. G. Smith Survey, 4½ miles south of Dew, in Freestone County, is also rather deep without many signs of encouragement. It is shut down at 5,228 feet in gray shale after coring from 5,195-5,221 feet showing sand and sandy shale carrying a very slight odor of oil.

Only two wildcat locations were staked in the district. One was by Stewart Brothers and Watson of Fairfield, on the T. N. Wilson farm in the Alex W. Patton Survey, 1½ miles southeast of Prairie Hill, in Freestone County. The other is to be drilled by J. B. Daniels on the Southern Pine Lumber Co. holdings in the Thompson Survey, near the south line of Cherokee County.

Gulf Production Co.'s No. 1 Davey and Royall, in the M. Rogers Survey, Anderson County, topped the Pecan Gap chalk at 3,893 feet and is drilling at 3,940 feet. Two miles southwest, Ownby Drilling Co. has staked a location on the A. T. Lively 40-acre tract in the Phillips Martin Survey, for a shallow test. Another test is expected to be drilled on the J. W. Camp 10-acre lease, 1 mile north of the Davey and Royall test, by Neill McDowell of Elkhart. These tests are to be drilled in quest of saturated sand logged in the Gulf test from 466-81 feet. Other tests in this Camp Hill area have also shown shallow oil saturations, and a shallow pool may be opened. Gulf Production Co. did not test the formation showing oil, but may drill a shallow offset, or plug back its Woodbine test if it does not prove a producer.

Florence Oil Co.'s test, a short distance east of the Carroll district of the Van Field, Van Zandt County, is down 2,983 feet in sandy shale and running low. No Woodbine has been cored and the test looks disappointing.

Cosden Oil Co.'s test on the Hurt and Miller lands, in the J. B. Hayes Survey, in eastern Henderson County, is shut down for repairs at 5,150 feet in red beds. This is one of the more important tests in the district, several major companies purchasing acreage in the area when announcement was made that a test would be sunk on the leases nearing expiration. It does not look encouraging at the present depth, no showings of oil or gas having been logged.

EAST TEXAS FIELD

There are now over 15,000 producing wells in the East Texas Field where the average weighted bottom hole pressure is still up to 1,220 pounds. Overproduction has been curtailed during the past two weeks, daily average production running around 442,000 bbls. per day this week, including an estmated 35,000 bbls. of overproduced oil. Cutting back production will help to bolster pressures, slowing down the bottom-hole pressure decrease. Out of the 56 wells completed this week, only one was put on air lift and two were completed swabbing. No pumpers were reported, although for many weeks pumping wells have been reported completed each week. There were 65 locations staked, locations and completions remaining about equal.

COMPLETIONS IN EAST TEXAS

Gregg County

Atlantic Oil Producing Co.'s No. 59 Hayes, total depth 3,567 feet, initial production 125 bbls. hour; No. 6-B Judge, total depth 3,536 feet, initial production 135 bbls.; No. 8-B Judge, total depth 3,529 feet, initial production 125 bbls. hour; No. 11-B Judge, total depth 3,529 feet, initial production 130 bbls. hour; No. 13-B Judge, total depth 3,523 feet, initial production 125 bbls. hour. Doss-Jones' No. 7 Hagler, top pay 3,578 feet, total depth 3,588 feet, initial production 45 bbls. in 40 minutes.

Gulf Production Co.'s No. 60 Judge, total depth 3,520 feet, initial production 83 bbls. hour. Humble Oil & Refining Co.'s No. 20 Armstrong, top pay 3,557 feet, total depth 3,584 feet, initial production 84 bbls.; No. 32 Hughes, top pay 3,634 feet, total depth 3,669 feet, initial production 92 bbls.; No. 8 Castleberry, top pay 3,461 feet, total depth 3,494 feet, initial production 56 bbls. hour. Lechner & Hubbard's No. 7 McGredge, top pay 3,640 feet, total depth 3,654 feet, initial production 75 bbls. Lee & Burnett's No. 1 Shepherd, top pay 3,675 feet, total depth 3,709 feet, initial production 20 bbls. per hour by heads. Sells Petroleum Co.'s No. 1 Clements, top pay 3,553 feet, total depth 3,600 feet, initial production 40 bbls. in 30 minutes. Selby Oil & Gas Co. and others' No. 21-A Snavely Heirs, top pay 3,568 feet, total depth 3,576 feet, initial production 31 bbls. in 30 minutes.

Shell Petroleum Corp.'s No. 27 Moore, top pay 3,535 feet, total depth 3,561 feet, initial production 30 bbls. in 30 minutes. Stanolind Oil & Gas Co.'s No. 7 Cox & Hammond, total depth 3,548 feet, initial production 28 bbls. in 20 minutes. T. W. M. Oil Co.'s No. 2-A Riber, total depth 3,585 feet, initial production 15 bbls. in 45 minutes. Tide Water Oil Co.'s No. 9 Jones, top pay 3,654 feet, total depth 3,690 feet, initial production 11 bbls. in 10 minutes through 1-inch choke. Wood and others' No. 3 Corbin, total depth 3,580 feet, initial production 35 bbls. in 30 minutes.

Yount Lee Oil Co.'s No. 10 Jones, top pay 3,535 feet, total depth 3,555 feet, initial production 60 bbls. per hour through eleven-sixteenths inch choke; No. 6 Rodden, top pay 3,583 feet, total depth 3,602 feet, initial production 55 bbls. per hour through eleven-sixteenths inch choke; No. 6-A Whatley, top pay 3,480 feet, total depth 3,500 feet, initial production 60 bbls. per hour through eleven-sixteenths inch choke.

Gulf Production Co.'s No. 21 Holt, top pay 3,569 feet, total depth 3,585 feet, initial production 75 bbls. per hour; No. 4 Still, top pay 3,494 feet, total depth 3,531 feet, initial production 20 bbls. in 2 hours on air lift. Humphrey's No. 15 Spear, total depth 3,597 feet, initial production 50 bbls. hour. Luttes and others' No. 2 Green, top pay 3,658 feet, total depth 3,668 feet, initial production 75 bbls. in 30 minutes. Moos' No. 7 Marshall, total depth 3,549 feet, initial production 210 bbls. in four hours; No. 12 Marshall, total depth 3,552 feet, initial production 40 bbls. hour. Potter and others' No. 1 Laird, total depth 3,565 feet, initial production 30 bbls. hour by heads.

Texas Co.'s No. 38 Cole, top pay 3,515 feet, total depth 3,545 feet, initial production 30 bbls. hour; No. 9 Walker, top pay 3,575 feet, total depth 3,580 feet, initial production 20 bbls. in 30 minutes. Tide Water Oil Co.'s No. 9 Blackman, top pay 3,657 feet, total depth 3,662 feet, initial production 10 bbls. in 10 minutes.

Smith County

Genecov-Roosch's No. 1 Bateman, total depth 3,766 feet, initial production 50 bbls. hour. Stewart-Eagin's No. 1 Wilson, top pay 3,752 feet, total depth 3,754 feet, initial production 40 bbls. in 37 minutes. Sun Oil Co.'s No. 8-B Pace, top pay 3,705 feet, total depth 3,712 feet, initial production 89 bbls. hour.

Rusk County

American Liberty Oil Co.'s No. 5 Frederick, top pay 3,563 feet, total depth 3,636 feet, initial production 36 bbls. hour; No. 6 Frederick, top pay 3,564 feet, total depth 3,633 feet, initial production 36 bbls. hour. Atlantic Oil Producing Co.'s No. 29 Kinney, total depth 3,645 feet, initial production 35 bbls. hour; No. 6-F Yount, total depth 3,735 feet, initial production 96 bbls. hour. Collins' No. 1 Reawine, top pay 3,535 feet, total depth 3,570 feet, initial production 20 bbls. in two hours, swabbing.

Humble Oil & Refining Co.'s No. 6 Arnold, top pay 3,683 feet, total depth 3,731 feet, initial production 35 bbls. hour; No. 34-A Plowman, top pay 3,693 feet, total depth 3,716 feet, initial production 67 bbls. hour; No. 135 Crim, total depth 3,630 feet, initial production 35 bbls. hour; No. 9 Shaw, top pay 3,752 feet, total depth 3,767 feet, initial production 64 bbls. hour; No. 27 Patterson, total depth 3,631 feet, intiial production 84 bbls. hour.

Lone Pine Oil Co.'s No. 4 Wilson, total depth 3,669 feet, initial production 45 bbls. in 30 minutes. Magnolia Petroleum Co.'s No. 12 Wells, top pay 3,649 feet, total depth 3,710 feet, initial production 5 bbls. in five minutes. Marathon Oil Co.'s No. 5 Burton, total depth 3,613 feet, initial production 46 bbls. hour. Mercury Petroleum Co.'s No. 2 Young, top pay 3,742 feet, total depth 3,775 feet, initial production 20 bbls. in 15 minutes. Neversuch Oil Co.'s No. 11-A Givens, top pay 3,638 feet, total depth 3,662 feet, initial production 35 bbls. in 15 minutes.

Regent Oil Co.'s No. 4-B Harmon, total depth 3,810 feet, initial production 27 bbls. in 30 minutes. Tide Water Oil Co.'s No. 10 Pool, top pay 3,737 feet, total depth 3,780 feet, initial production 15

East Central Texas Wildcats

Week Ending November 10

ANDERSON COUNTY

Gulf Prod. Co.'s No. 1 Dovey & Royall, 330 ft. from NE and NW of 172-ac. tract, M. Rogers Sur.
Drlg. 3,525 ft.

J. W. Luttes' No. 1 C. McKee, 2,640 ft. from N line of lease and survey and 330 ft. from W line of McKey 800-ac. tract.
Derrick.

Trinity State Oil Co.'s No. 1 Trinity River, 1,870 ft. N and 1,200 ft. W of SW cor. of Sullenberger lands, Wm. Snyder Sur.
Rigged up.

BOWIE COUNTY

Tex-Ark. Oil Co.'s No. 1 Hamilton Estate, 660 ft. E and 350 ft. N lines, J. Milan Sur., 4 miles S of Red River.
Rigged up.

CHEROKEE COUNTY

J. B. Daniels' No. 1 Southern Pine Lbr. Co., 330 ft. from N and E lines of Thompson Sur. on S line of county.
Location.

Fidelity Oil & Royalty's No. 1 Holcomb, 330 ft. from S line and 330 ft. from E line of 90-ac. tract, being Sec. 30, Z. Gibbs Sur., 2 mi. S old Goldston dry hole.
Elev. 323 ft.; top Austin 4,859 ft.; drlg. 5,075 ft.

H. L. Hunt Prod. Co.'s No. 1 Powell Lumber Co., 467 ft. from S and W lines of 52-ac. tract, 1 mile E and one-quarter mile N of discovery well, D. W. McNab Sur.
Location.

Jacksonville O. & G. Co.'s No. 1 H. D. Henderson, 660 ft. from N and W lines of 40-ac. tract out of Tankersley 164-ac. tract, 5 miles NE of Jacksonville on W side of railroad, J. Pineda Sur.
T.D. 752 ft.; bailing to test.

Guy Jameson et al's No. 1 Mullineaux, cen. 20-ac. tract out of NW cor. of SE of T. M. Garrett Sur., 5 miles NW of Maydell.
Drlg. 4,720 ft.; elev. 342 ft.

South Gulf Oil Co.'s No. 1 Joe Bailey, center 164-ac. tract, 4 miles NE of Ponta, L. R. Rhodes Sur., Abstract No. 724.
T.D. 4,396 ft.; P.B. 4,183 ft.; S.D.

E. M. Thomason et al's No. 1 Addis Estate, 250 ft. S of survey and 150 ft. E of railroad, J. T. Jones Sur., 6 miles NW Alto.
S.D. 2,150 ft.

Wilson Stubbs Oil Co.'s No. 1 Rowborts, 450 ft. from S line, 150 ft. from W line of 100-ac. tract, 2 miles SW of Jacksonville, J. D. Wolfin Sur.
S.D. 1,550 ft.

ELLIS COUNTY

Beckner-Finley et al's No. 1 Coker, 2,900 varas along S line of grant from river and 1,700 varas N at R/A, R. De La Pena Sur.
S.D. 60 ft.

FALLS COUNTY

Eureka Drlg. Co.'s No. 1 L. Davis, 150 ft. N of Blk. 19, and 1,970 ft. W of Blk. 18, Zora League, 8 miles N of Marlin.
16 gallons oil per day at 1,020 ft.; S.D. 1,155 ft.

FREESTONE COUNTY

Burris' No. 1 R. J. Johnson, NE cor. of a 95.5-ac. tract, W. M. C. Jones Sur.
S.D. 1,000 ft.

Dodwell's No. 1 Pasadena, 660 ft. out of NW cor. of tract, J. Graham Sur., 3½ miles NE of Teagues.
Austin 3,560-3,920 ft.; S.D. 4,350 ft.

Hailey-Young's No. 1 Cochran, 400 ft. N and W lines, D. Bullock Sur., 1 mile SE of Lima.
Location.

E. L. Smith et al's No. 1 Heimple, 450 ft. out of NE cor. A. G. Smith Sur., 4½ miles S of Dew.
Elev. 492 ft.; top Austin 5,135 ft.; reaming 5,180 ft.

HARRISON COUNTY

W. G. Boyd et al's No. 1 W. L. Rudd, no check; in sec. of 360-ac. tract and sur., W. D. Perry Sur.
Coring 1,000 ft.

HENDERSON COUNTY

Campbell and Chamberlain's No. 1 R. Ansley, 1,724 ft. W and 300 ft. S of SE cor. of M. Matthews Sur., N. H. T. Thompson Sur.
Elev. 268 ft.; washing 2,650 ft.

Cosden Oil Co.'s No. 1 Hunt & Miller, 990 ft. from N and 1,340 ft. from W lines of J. D. Hays Sur., 11 miles S of Chandler.
Top sand 5,075-95 ft.; S.D. 5,146 ft.

Crosby and Pulp's No. 1 M. T. Dobbs, NW cor. of east Dobbs 100-ac. tract, 4 miles E of Malahoff and S of Railroad, George Aldrick Sur.
S.D. 3,124 ft.

HOPKINS COUNTY

D. A. Hale et al's No. 1 L. M. Hall, 300 ft. from N and E lines of 70-ac. tract, 1

(Continued on Page 142)

MURIATIC ACID
(HYDROCHLORIC)

WHEN TREATING OIL WELLS TO INCREASE THE FLOW---YOU WILL WANT QUICK, GOOD SERVICE.

WE HAVE OUR OWN RUBBER-LINED TANK CARS FOR DELIVERY.

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Banking Facilities

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THE

FORT WORTH NATIONAL BANK

Fort Worth, Texas

bbls. in 15 minutes. Wainwright-West's No. 2 Cox, top pay 3,671 feet, total depth 3,678 feet, initial production 50 bbls. hour; No. 3 Cox, top pay 3,646 feet, total depth 3,670 feet, initial production 50 bbls. hour. H. B. W. Oil Co.'s No. 7 Redwine, total depth 3,570 feet, initial production 20 bbls. in two hours, swabbing.

Upshur County

East Texas Petroleum Co.'s No. 2-B Ray, top pay 3,622 feet, total depth 3,626 feet, initial production 20 bbls. in 25 minutes. Humble Oil & Refining Co.'s No. 10-B Miller, total depth 3,718 feet, initial production 49 bbls. hour. Oils, Inc.'s No. 8 Sanders, top pay 3,588 feet, total depth 3,606 feet, initial production 30 bbls. hour.

Freestone County

Goldston's No. 1 Watson, top Woodbine 4,084 feet, top sand 4,113 feet, dry and abandoned 4,129 feet.

Hopkins County

Hill & Hill's No. 1 Jones, dry and abandoned 4,760 feet.

Navarro County

Stoddard, trustee's No. 1-A West, dry and abandoned 802 feet.

Rains County

Rio Oil Co.'s No. 1 Easter, dry and abandoned 4,353 feet.

Wood County

Snyder, Alex and others' No. 1 Holmes, dry and abandoned 5,330 feet.

Price Advance Halts Until Important Points Settled

(Continued from Page 135)

various regions, especially north central states, are calling for special cold weather gasoline and the higher gravity-lower end-point items are a little more active at fractionally better prices. The trade also is considerably interested in probable octane ratings of gasoline for new model motor cars.

Heating Oils

Heating oils of the better grades likewise are in strong current market positions, having reached their best levels of the season, without any real winter weather having been encountered as yet. Impossibility of obtaining supplies out of East Texas seems to be the impelling reason. Some distributors do not appear to have prepared fully for their requirements and have been buying even at advancing prices to protect themselves.

Heavy Fuels

Industrial activity may be picking up a little, but not enough to affect the general level of industrial fuel prices, although these items are quite firm. Gas oils are also steady, with supplies limited.

Lubricants

Lubricants have become extremely quiet, in view of the weakness in Pennsylvania Grade crude. Buying has tapered off to quite an extent recently, in the various grades. Jobbers are not greatly interested. Compounders are limiting their own purchases. Neutrals appear to be in the best market situation.

Naphthas

Extreme quietness rules naphthas and solvents, as for some time in the past. No price changes are reported of any importance. Lacquer diluent business is reported fair, V.M.&P. demand also moderately good.

Wax

Call for better grades of wax has shown a few indications of picking up in spotty fashion, but as a whole this product is rather dull, prices unchanged.

Coke

Petroleum coke is attracting some seasonable attention. Supplies are not overburdensome, prices are unchanged.

ROCKY MOUNTAIN PRODUCTION

Estimated daily average production for the week ending November 10 follows:

WYOMING

	Bbls.
Salt Creek	17,900
Big Muddy	1,720
Badger Basin	30
Black Mountain	140
Byron	420
Dallas Derby	560
Dutton Creek	70
Elk Basin	440
Ferris	40
Frannie	1,580
Garland	1,540
Grass Creek	630
Greybull	10
Hamilton Dome	330
Hudson	330
LaBarge	1,320
Lance Creek	200
Lost Soldier	1,750
Mule Creek	shut in
Midway	90
Notches	shut in
Oregon Basin	2,450
Osage	730
Pilot Butte	30
Rex Lake	70
Rock River	1,440
South Casper	590
Poison Spider	240
Teapot	20
Total Wyoming	35,240

MONTANA

Buckley-Border	250
Cat Creek	600
Cut Bank	4,100
Dry Creek	0
Kevin-Sunburst	5,500
Lake Basin	40
Pondera	1,420
Total Montana	11,910

COLORADO

Florence	320
Fort Collins and Wellington	470
Iles Dome	1,680
Moffat	470
Orchard	100
Rangely	90
Tow Creek	160
Total Colorado	3,290

NEW MEXICO

Artesia	550
Cooper area	750
Empire area	100
Eunice area	3,470
Getty Pool	0
Hobbs	33,090
Hogback	200
Hospah	shut in
Jal	3,090
Lea area	1,750
Jackson	1,500
Majamar	370
Rattlesnake	760
Table Mesa	90
Total New Mexico	45,720
Total Rocky Mountain region	96,160

West Texas Wildcats

(Continued from Page 137)

EL PASO COUNTY

Mesa Oil Co.'s No. 1 Coronado Valley S.D. 1,415 ft.

FISHER COUNTY

Merry Bros. and Perrini, Inc., et al's No. 1 Dean, 660 ft. from S and E, Sec. 2, Blk R., W. E. Richardson Sur.
Drlg. 2,780 ft.

Merry Bros. and Perrini's No. 1 Howard, 1,320 ft. from N and 660 ft. from E, Sec. 180, Blk. 2, H.&T.C. Sur.
Tools.

Roeser & Pendleton's No. 2 Hill, 2,310 ft. from N and 330 ft. from E, Sec. 203, B.B.B.&C. Sur.
Standard tools.

Texas Co.'s No. 1 First National Bank of Rotan, 330 ft. N and E of the NW cor. of Sec. 210, B.B.B.&C. Sur.
T.D. 3,244 ft; to P.B. and treat.

GLASSCOCK COUNTY

Currie et al's No. 1 Currie, 330 ft. from S and W, Sec. 10, Blk. 35, Twp. 4s, T.&P. Sur.
Cellar.

John L. Moore et al's No. 1 J. S. McDowell 1,980 ft. from N line and 660 ft. from E line of Sec. 22, Blk. 34, Twp. 2s, T.&P. Sur.
Drlg. 6,615 ft.

Wahlenmaier Pet. Corp.'s No. 1 Boyd, 990 ft. from N and E, Sec. 9, Blk. 36, Twp. 4s T.&P. Sur.
Drlg. 3,392 ft.

World Oil Co.'s No. 3-C McDowell, 2,310 ft. from N and W, Sec. 21, Blk. 34, Twp. 2s, T.&P. Sur.
Drlg. 330 ft.

HOWARD COUNTY

Fred Hyer et al's No. 1 Clay, 2,310 ft. from N and 330 ft. from E, Sec. 126, Blk. 33, W.&N.W. Sur.
T.D. 1,562 ft.; cleaning out; T.P. 1,605 ft.

F. H. E. Oil Co.'s No. 2 Dodge, 330 ft. from N and 990 ft. from E, Sec. 15, Blk. 30, Twp. 1s, T.&P. Sur.
Drlg. 210 ft.

Illinois Oil Co.'s No. 1 Logan, 990 ft. from N line, 2,310 ft. from E line, Sec. 2, Blk. 30, Twp. 1s, T.&P. Sur.
Shot twice; swabbed 127 bbls. in 34 hrs.

Iron Mountain Oil Co.'s No. 1 Read, 330 ft from E line, 330 ft. from S line, Sec. 46 Blk. 30, Twp. 1n, T.&P. Sur.
Drlg. 2,385 ft.
Mixon et al's No. 1 Capps & Lucas, 2,310 ft. from S and 330 ft. from W, Sec. 17, Blk 29, Twp. 1n, T.&P. Sur.
Drlg. 2,087 ft.
Slagel's No. 1 Foster, 990 ft. from S and 330 ft. from W, Sec. 43, Blk. 29.
Spudded.

IRION COUNTY

Melrose Oil Co.'s No. 1 J. D. Sugg, 1,700 ft from the E line and 308 ft. from the S line of Sec. 25, Blk. 2, H.&T.C. Sur.
S.D. 270 ft.

JEFF DAVIS COUNTY

C. M. Joiner's No. 1 Jones & Coffield, 770 ft. from N and 1,322 ft. from E, Sec. 8, Blk. 3, H.&T.C. Sur.
Standard tools.

JONES COUNTY

Campbell et al's No. 1 Enevill, 1,400 ft. from N and 270 ft. from W, Sec. 2, M.E.&P. Sur., ½ mile S of Anson.
Drlg. 580 ft.
Capitan Oil Co.'s No. 1 Geiger, 220 ft. from S and E of 60-acre tract, S. Andrews Sur.
Drlg. 575 ft.
Choate et al's No. 1 Faver, 170 ft. from S and E of Subdiv., A. Thompson Sur. No 30.
S.D. 2,010 ft.
Condor Pet. Co.'s No. 2 Holt, 660 ft. from S and 330 ft. from E, Sec. 4, Blk. 20.
Cellar.
Hammer & Beam's No. 1 Sheppard, 1,308 ft. from N and 200 ft. from E of 180-acre tract, D. Minter Subdv. No. 53.
Set csg. 1,400 ft.
Ray & Staniforth's No. 1 Stewart, 600 ft. E of Texas Inland Oil Co.'s No. 1 Inland.
Drlg. 1,710 ft.
Richards et al's No. 1 Ransom, 200 ft. from N and E. Sec. 244, B. M. Clopton Sur.
Drlg. 330 ft.
Southern Oil Co.'s No. 2 Cade, 330 ft. S and 990 ft. E in Sec. 17, Blk. 19, T.P. Sur.
Drlg. 2,256 ft.
Texas Inland Oil Co.'s No. 1 Boas, 330 ft from N and W of N 311 acres of S 611 acres, John Wall Sur. No. 272.
Swedging csg. 2,507 ft.
Texas Inland Oil Co.'s No. 2 Sellers, 640 ft from N and 200 ft. from W, Wm. Delk Sur. No. 241.
T.D. 1,886 ft.; to re-treat with acid.

LOVING COUNTY

D. C. Evans' No. 1 W. D. Johnson, 2,310 ft from N and 1,650 ft. from W, Sec. 13 Blk. 57, Twp. 1, T.&P. Sur
S.D. 2,030 ft.; 1 bbl. sulphur water.

PECOS COUNTY

Adams et al's No. 1 Schearer.
Location.
Adams et al's No. 1 Masterson.
Location.
Gulf Prod. Co.'s No. 2 White and Baker, 330 ft. from N and E of Sec. 42, Blk. 194, G.C.&S.F. Sur.
Drlg. 1,487 ft.
Gulf Prod. Co.'s No. 3 White & Baker, SE cor. of N half Sec. 4, Block 207, T.C. Ry. Sur.
Drlg. 353 ft.
C. S. Messenger's No. 2 Rand Jones, 1,925 ft. from S line and 1,913 ft. from W line of Sec. 5, Blk. 9, H.&G.N. Sur.
Shutting off water 2,048 ft.
Trans-Tex. Oil Co.'s No. 1 Caldwell, 330 ft from E line and 330 ft. from S line of Sec 37, Blk. 40, Twp. 9, T.&P. Sur.
S.D. 1,301 ft.

REAGAN COUNTY

E. P. Kirschner and White's No. 1 W. A. White and McIntosh, 720 ft. from E and 400 ft. from N of Sec. 1,223, E.L.R.R. Sur.
S.D. 3,165 ft.
Skelly Oil Co. et al's No. 1-D E. S. Grayson, 1,980 ft. from N line and 660 ft. from W line of Sec. 33, Blk. 8, University Land Sur.
Drlg. 5,772 ft.
Williams et al's No. 1 Scott.
S.D. 2,775 ft.

REEVES COUNTY

J. E. Cunningham's No. 1 Altman, 2,310 ft. from N line and 1,980 ft. from E line of Sec. 1, C. C. Wyatt Sur.
Recemented csg. 1,576 ft.

RUNNELS COUNTY

Mail Oil Co.'s No. 1 Brevard, 160 ft. N and W in Subdiv. 21, D. Diaz Sur.
Drlg. 2,353 ft.
Melrose Oil Co.'s No. 1 L. P. Woods, 150 ft. from NE lines and 3,475 ft. from W line of survey, Willett Holmes Sur. No. 100.
S.D. 1,495 ft.
R. Wells' No. 1 James, 396 from N and 330 ft. from E of James tract in Sec. 16, D Diaz Sur.
S.D. 180 ft.

SCHLEICHER COUNTY

John M. Cooper et al's No. 1 Bert Page, 1,290 ft. from N line, 1,470 ft. from W line of Sec. 40, Blk. L, G.H.&S.A. Sur.
S.D. 5,866 ft.
Humble Oil & Ref. Co.'s No. 1 Ike Honig, 2,640 ft. from N line and 2,650 ft. from E line of Sec. 38, Blk. M, G.H.&S.A. Sur.
Drlg. 5,550 ft.
W. C. Proctor et al's No. 1 Judkins & Spencer, 1,320 ft. from S and W of W. W. Russell grant.
Location.

SCURRY COUNTY

Coffield & Guthrie's No. 1 Holliday, 2,310 ft. from N and 330 ft. from W, Sec. 130, Blk. 97, H.&T.C. Sur.
Drlg. 410 ft.

STERLING COUNTY

John L. Moore's No. 1 McIntire, 660 ft. from S and E. Sec. 35, Blk. 23, H.&T.C. Sur.
S.D. 2,643 ft.
Merry Bros. & Perrini's No. 1 Standsberry, 1,980 ft. from N and E Sec. 20, Blk. 30, W.&N.W. Sur.
Location.

STONEWALL COUNTY

Merry Bros. and Perrini et al's No. 1 Williams, C SW of SW, Sec. 6, Blk. C, A B. &M. Sur.
Drlg. 2,470 ft.

SUTTON COUNTY

Texas & Hesselman's No. 1 Mower, 1,980 ft. from S and W of Sec. 39, Blk. 5, T.W.& N.G. Sur.
Rigging up.

TAYLOR COUNTY

Dunnigan Bros. et al's No. 2 Hunter, 850 ft. from S and 350 ft. from W of Subdiv. No. 14, Willis Sur.
Fishing 2,235 ft.

TERRELL COUNTY

W. A. Sudderth's No. 1 Phelps, 2,157 ft. from N line and 2,482 ft. from the W line of Sec. 5, Blk. 4-A, G. W. Turley Sur.
S.D. 5,635 ft.; C.O.

UPTON COUNTY

Gulf Prod. Co.'s No. 12 Crier-McElroy, 1,320 ft. from N and E Sec. 198, Blk. F.
Drlg. 510 ft.
Gulf Prod. Co.'s No. 103 McElroy, 1,980 ft. from S and 660 ft. from W, Sec. 197, Blk. C. C.C.S.D.&R.G.N.G. Sur.
Drlg. 10,929 ft.
Williams & Williams Drlg. Co.'s No. 1 Robbins, 1,600 ft. from S and 1,900 ft. from E, Sec. 4, G.C.&S.F. Sur.
S.D. 2,040 ft.

WARD COUNTY

Atlantic Oil Prod. Co.'s No. 1 Miller, 463 ft. from NW and 504 ft. from NE Sec. 3, J. C. Russell Sur.
Fishing 2,021 ft.
Alexander's No. 1 Richter, 1,650 ft. from NW, 1,170 ft. from NE line of Sec. 37 Blk. 34, H.&T.C. Sur.
S.D. 1,700 ft.
Bradford et al's No. 1 E. R. Allen, 660 ft. from NW line and 551 ft. from NE line Sec. 11, H.&T.C. Sur.
Fishing 500 ft.
Cook Drlg. Co.'s No. 1 Wood, 330 ft. from NW and SW, Sec. 5, W. F. Stewart Sur.
Cleaning out 2,548 ft.
Plains Prod. Co.'s No. 1 J. J. McGregor, 660 ft. from SE line, 660 ft. from SW line Sec. 169, Blk. 34, H.&T.C. Sur.
Drlg. 3,888 ft.
Postelllo & Caprito's No. 1 Purcell, 330 ft from NE and 990 ft. from NW, Sec. 17 Blk 34 H.&T.C. Sur.
Drlg. 1,265 ft.
Sageland Oil Corp.'s No. 2 Pure-Bennett 1,650 ft. from NW and 2,310 ft. from SW Sec. 16, Blk. 34, H.&T.C. Sur.
Spudded and S.D.
Tex-Mex Pet. Corp.'s No. 1 Pure-Bray, 1,980 ft. from NE and 660 ft. from NW, Sec. 6, Blk. 5, H.&T.C. Sur.
Drlg. 575 ft.
West Texas O. & R. Co.'s No. 1-C University, 330 ft. from N and E, Sec. 6, Blk. 16.
Location.

WINKLER COUNTY

Harry Adams' No. 2 Scarborough, 990 ft from N line and 990 ft. from W line, Sec 2, Blk. 77, P.S.L. Sur.
Location.
Jeffries et al's No. 1 Brown & Altman 2,310 ft. from S and W, Sec. 6, Blk. B-5
Drlg. 1,938 ft.
J. C. Maxwell's No. 1 Clapp, 1,980 ft. from N and 330 ft. from W, Sec. 37, Blk. 26 P.S.L. Sur.
Drlg. 1,132 ft.
Magnolia Pet. Co.'s No. 4 Walton, 330 ft from S and W, Sec. 1, Blk. 26.
Drlg. 328 ft.
R. S. Mathews et al's No. 1 Evans, 1,320 ft from N line and 1,320 ft. from W line Sec. 46, Blk. 73, P.S.L. Sur.
S.D. 110 ft.
Mid-Continent Pet. Corp.'s No. 1 Howe, 2,310 ft. from N and 330 ft. from W, Sec. 12, Blk. 26, P.S.L. Sur.
Rotary.
Sid Richardson's No. 1 Hill, 1,980 ft. from E line, 660 ft. from S line, Sec. 18, Blk. B-11, P.S.L. Sur.
Drlg. 3,879 ft.
Sayre Oil Co.'s No. 1 Leck, 330 ft. from S and E, Sec. 2, Blk. 26, P.S.L. Sur.
Derrick.
Sayre Oil Co.'s No. 2 Howe, 330 ft. from N and W, Sec. 12, Blk. 26, P.C.L. Sur.
Location.
Skelly Oil Co.'s No. 2 Holley, 1,320 ft. from N and 2,200 ft. from E, Sec. 25, Blk. B-11, P.S.L. Sur.
Tools.
Sinclair Prairie Oil Co.'s No. 1 Cummings, 2,310 ft. from N and 330 ft. from E, Sec. 11, Blk. 26, P.S.L. Sur.
Rotary rigged up.

Texas Panhandle Wildcats

Week Ending November 10

CARSON COUNTY

McGill's No. 1 Cooper, 330 ft. from S and W of N½ NE Sec. 4, Blk. 9, I.&G.N. Sur.
Drlg. 1,015 ft.

CHILDRESS COUNTY

Humble Oil & Ref. Co.'s No. 1 B. P. Smith, 1,327 ft. from S line and 1,327 ft. from E line of Sec. 27, H.&G.N. Sur., Blk. 9.
Fishing 5,217 ft.

COLLINGSWORTH COUNTY

Andrews & Kerr's No. 1 Gideon-Bell, C NW NE Sec. 6, Blk. 13, H.&G.N. Sur.
Rigging up.

DALLAM COUNTY

Eben Warner's No. 1 Jarbie, 1,520 ft. from S line, 415 ft. from W line, Sec. 2, B.&B. Sur.
S.D. 3,200 ft.; may abandon.

GRAY COUNTY

Dixon Creek Oil Co.'s No. 1 Benedict, 330 ft. from S and 330 ft. from W, Sec. 114, Blk. 3, I.&G.N. Sur.
T.D. 3,270 ft.; putting on pump.
Irish-American Oil Co.'s No. 1-B Morse, 990 ft. S and 330 ft. E, W½ NE Sec. 54, Blk. 25, H.&G.N. Sur.
Rig.
Southwest Prod. Co.'s No. 1 T. Cobb, 1,320 ft. from S line, 990 ft. from E line, NE Sec. 134, Blk. 3, I.&G.N. Sur.
T.D. 2,370 ft.; to deepen.
Texas Co.'s No. 1-C Taylor, 1,325 ft. from N and 1,320 ft. from W, Sec. 52, Blk. B-2 H.&G.N. Sur.
Drlg. 2,585 ft.

HUTCHINSON COUNTY

Brownie Oil Co.'s No. 1 Ware, 330 ft. from N and 330 ft. from W, Sec. 124, Blk. 4, I.&G.N. Sur.
T.D. 3,075 ft.; T.P. 3,040 ft.; swbd. 90 bbls. oil in 8 hrs. after shot.
Huey et al's No. 1 Christian, 220 ft. from S and 330 ft. from W, Sec. 32, Blk. Y, A.&B. Sur.
Drlg. 2,850 ft.; 4,000,000 ft. of gas.

MOORE COUNTY

Alma Oil Co.'s No. 1 Jones, 330 ft. N and W, Sec. 171, Blk. 3-T, T.&N.O. Sur.
Rig.
Phillips Pet. Co.'s No. 2 J. C. Wilson, Sec. 157, Blk. T-3, T.&N.O. Sur.
Drlg. 7,203 ft.
Sunray Oil Co.'s No. 2-A Jones, 330 ft. S and W lines Sec. 164, Blk. 3-T, T.&N.O. Sur.
T.D. 3,349 ft.; 82,500,000 ft. of gas.
Texoma Nat. Gas Co.'s No. 3-P Sneed, 3,734 ft. N and E of M. George Sur.
Rig.

RANDALL COUNTY

English et al's No. 1 Oxnard.
Fishing 5,375 ft.

WHEELER COUNTY

Bell O. & G. Co.'s No. 1 Plummer, 330 ft. S and E of NW Sec. 45, Blk. 24, H.&G.N.
Drlg. 2,166 ft.
Bowers & Carvers' No. 1 L. B. Sims, 330 ft. from N line, 330 ft. from E line of SW Sec. 60, Blk. 17, H.&G.N. Sur.
S.D. 2,166 ft.
Carver Drilling Co.'s No. 1 Rock Island, 1,600 ft. from S line, 2,310 ft. from W line, Sec. 47, Blk. 13, H.&T.C. Sur.
Drlg. 110 ft.
Christie-Hickman's No. 1 Walker, 330 ft. S and E of NE Sec. 49, Blk. 24, H.&G.N. Sur.
Set csg. 2,275 ft.
Dyke Oil Co.'s No. 1 G. W. Sitter, 330 ft. from N line, 330 ft. from E line, N½ NW Sec. 28, Blk. 24, H.&G.N. Sur.
S.D. 1,330 ft.
Ben G. Barnett's No. 1 Boren, NW cor. NE Sec. 24, Blk. 13, H.&G.N. Sur., 11 miles E and S of Shamrock.
S.D. 1,710 ft.
Johnson et al's No. 1 Grogan, 438 ft. N and 150 ft. W, Sec. 57, Blk. 23, H.&G.N. Sur.
Spudded and S.D.
LeFors Pet. Corp.'s No. 1 Perkins, 330 ft. from S line, 330 ft. from W line, Sec. 54, Blk. 24, H.&G.N. Sur.
Rig up.
Mudge Oil Co.'s No. 1 Dougherty, C SW Sec. 98, Blk. 23, H.&G.N. Sur.
Drlg. 635 ft.
Reno Oil Co.'s No. 1 Mankins, SW SE SE Sec. 54, Blk. 13, H.&G.N. Sur.
T.D. 2,216 ft.; shut in for P.L. connections.
Smith Bros.' No. 1 Williams, 330 ft. N and E, W½ SE Sec. 49, Blk. 24, H.&G.N. Sur.
Drlg. 1,820 ft.
Underwood et al's No. 1 Roach, 330 ft. N and E, Sec. 27, Blk. 24, H.&G.N. Sur.
Cellar.

Question: *Are Fluid Packed Pumps Efficient in Pumping* LIGHT, CLEAN OIL *from* DEEP WELLS?

HERE'S THE ANSWER!

RECORD OF PUMP PERFORMANCE

* Company - [redacted]
Field - Santa Fe Springs, Calif.
Pump - Fluid Packed
Size and Type - Positive Pull - 2"X 18'
Date Installed - August 1, 1934
Tubing Depth - 6800 feet
Fluid Level - about 6000 feet
Average Daily Production - 84 Bbl.
Water Cut - 2% Gravity - 32°
RPM - 19 Sand Cut - None
Down Time - None Length of Stroke - 52 ins.

Whether your oil is light or heavy, clean or with a large sand or water cut, Fluid Packed Pumps will give you freedom from trouble, long life and low maintenance costs.

Let us send you the PLAIN FACTS about Fluid Packed Pumps. Just write our nearest office.

Positive Pull Type **Name on Request*

FLUID PACKED PUMP CO.
BOX 64 • LOS NIETOS, CALIFORNIA • U.S.A.
MID-CONTINENT AND TEXAS DISTRIBUTION
FLUID PACKED PUMP CO.—MID-CONTINENT
2 S. E. 29TH ST., OKLAHOMA CITY, OKLAHOMA
Gulf Coast Headquarters: 409 Velasco St., Houston, Texas
London Office: Coventry House, South Place, London E.C. 2, England

A MODERN PUMP FOR MODERN CONDITIONS
Protected by Patents No. 1545474, 1545475, 1549175, 1621046; others pending.

East Central Texas Wildcats

(Continued from Page 139)

mile SE of Miller Gros. A. Caro Sur.
Drlg. 1,515 ft.

HUNT COUNTY

Cauble & Thompson's No. 1 Reed, 330 ft. N of northerly NE cor. of C. B. Payne Sur., but in F. Thweatt Sur., 3 miles SE of Greenville.
Derrick.

G. S. & S. Co.'s No. 1 O. Popper.
S.D. 2,885 ft.

J. C. Hall's No. 1 Parrish, C of 100-ac. tract, N. Delaney Sur., 5 miles N of Lone Oak.
Moving in derrick.

L. G. Priest's No. 1 Amelia Barnett, 1,075 ft. from W line, 320 ft. from S line of J. C. Hamer Sur.
S.D. 2,660 ft.

Winnans' No. 1 J. R. Phillips, 320 ft. from S line and 960 ft. from W line of tract and survey, W. J. James Sur.
S.D. 40 ft.

KAUFMAN COUNTY

W. J. Lewis et al's No. 1 D. Clark, 430 ft. from S line and 600 ft. from E line of Sur., 6½ miles NW of Elmo.
S.D. 478 ft.

LEON COUNTY

Normangee Corp.'s No. 1 B. H. Henry, 1,850 ft. from E line and 2,700 ft. from N line of survey, Robert Rogers League, 2½ miles NE of Normangee.
Fishing 2,740 ft.

LIMESTONE COUNTY

Doughtry et al's No. 1 S. Welch, 150 ft. from NW and 900 ft. from NE of 77.64-acre tract in A. Varilia Sur., 4 miles W of Groesbeck.
Rigged up.

Schultz' No. 1 Roy Ward, NE cor. of 73.3-ac. tract, 5 miles W of Mexia Field, Harrison York Sur.
Derrick.

Stewart Bros. and Watson's No. 1 T. N. Wilson, 1,400 ft. W and 330 ft. N of 236.1-ac. tract in Alex W. Patton Sur., 1½ mi. SE of Prairie Hill.
Location.

V. V. Waite's No. 1 Barrow, 650 ft. from S and 960 ft. from E line of 320-ac. tract, W. G. McKenzie Sur., 3½ miles NW of Thornton.
Pits.

MORRIS COUNTY

McGinnis et al's No. 1 Staggers, 800 ft. from S line of survey and 150 ft. from W line of lease, J. B. Nelson Sur.
S.D. 4,255 ft.

Fleetborn Oil Corp.'s No. 1 Hammond, 1,500 ft. S and 1,750 ft. W of Thos. Burford Sur., 3 miles SE of Omaha.
Rigged up.

NACOGDOCHES COUNTY

Murray Oil Co.'s No. 1 C. B. Watkins, 150 ft. from N line and 330 ft. from NW lines of 160-ac. tract, 3 miles S of Caro, H. Y Bailey Sur.
Washing to bottom; T.D. 3,815 ft.

NAVARRO COUNTY

Bennett Brothers' No. 1 T. E. Stewart, 150 ft. from NE line of lease, 10 miles SW of Corsicana, Wm. R. Bowen Sur.
S.D. 1,186 ft.

R. B. Cocding et al's No. 1 Lela Kelt, 450 ft. from S line and center of N and + lines of lease, 3 miles NE of Chatfield C. B. Emmons Sur.
S.D. 1,340 ft.; (corrected).

W. J. Keeling et al's No. 1 J. F. Rushing 484 ft. from N line and 150 ft. from W line of 184-ac. tract, 6 miles SW of Richardson, Henry Ford Sur.
T.D. 2,880 ft.

McCullough et al's No. 1 C. Berry, 330 ft from SE cor. of 35-acre tract, 1 mile W of Dawson, William Moss Sur.
S.D. 625 ft.

Syam Oil Co.'s No. 1 Mrs. Ray, 965 ft. E along N line from NW cor. Stevenson 101-acre tract and 305 ft. N at right angles 3 miles SW of Rural Shade.
Top Woodbine 3,480 ft.; S.D. 4,002 ft.

RAINS COUNTY

Wadley et al's No. 1 P. F. Jones, 400 ft. out of SW cor. of 32-ac. tract, 2½ miles S of Alba, B.B.B.&C. Sur.
S.D. 4,632 ft.

RED RIVER COUNTY

Abercrombie & Harrison's No. 1 Emma Watson, 4,850 ft. from W line and 4,550 ft from N line of survey, E. H. Tarrant Sur
Drlg. 250 ft.

Bryant and Speer's No. 1 Jones, 300 ft. W and 150 ft. N of 67-ac. tract, J. Compton, 3 miles SE of Emory.
Location.

RUSK COUNTY

Fair, et al's No. 1 J. W. Needham, 335 ft. from W line and 700 ft. from N line of tract and survey, 10 mi. S of Henderson, on 135-ac. tract, J. W. Chambers Sur.
Elev. 354 ft.; drlg. 3,180 ft.

Headwater Oil Co.'s No. 1 F. L. Gary, 375 ft. N of S line and center of E and W lines of 200-ac. tract, 8 miles E and S of Henderson, Jose A. Mora Sur.
S.D. 3,197 ft.; top Austin 3,130 ft.

George Hudson et al's No. 3 Jeff Phillips 150 ft. from N line of survey and 700 ft. from W line of 160-ac. tract, 4 miles SE of Minden, N. Villaria Sur.
S.D. 3,673 ft.

Ben Lamb's No. 1 H. Leath, 330 ft. out of NW cor. of 125-acre tract in L. J. Dooley
S.D. 1,970 ft.; (corrected).

SMITH COUNTY

Deck et al's No. 1 Dendall, 330 ft. from S and W of 55-ac. tract, J. Williams Sur., 3 miles E of Van Field.
Spudded and S.D.

Fair et al's No. 1 Rushing, 1,000 ft. SE of old hole, 1¼ miles SE of Whitehouse.
Top Woodbine 4,296 ft.; S.D. 4,673 ft.

Nenny et al's No. 1 J. I. Coulter, 1,217 ft. E of W line and 865 ft. N of S line of 100-ac. tract, Maria Gestrada Sur., 2 mi NW of Sand Flat.
Drlg. 1,856 ft.

Paul S. Williams et al's No. 1 Dean, 330 ft. E and 730 ft. N of 100-acre tract in Denson Moore Sur., 1 miles NE of Bullard.
Elev. 485 ft.; set csg. 70 ft.

VAN ZANDT COUNTY

Pet. P. L. & Storage Co.'s No. 4 Mrs. S. McGee, 450 ft. S of N line and 155 ft. E of W line of 53.4-ac. tract, Blk. 30, Elevation 441 ft.
Set csg. 730 ft.

Pete Corley et al's No. 1 Slaton, 160 ft. from W and 660 ft. from N lines of William Carlton Sur., 3 miles SE of Ben Wheeler.
Rig.

Gillum and Allen et al's No. 1 A. T. Bass 150 ft. from W line and 150 ft. from N line of 10-ac. tract, William Hart Sur.
S.D. 1,700 ft.

Green and Winn's No. 1 Eaton, 330 ft. out of most westerly SW cor. of J. Wilson Sur., 2 miles SE of Martin.
Location.

Rogers & Schwartz's No. 1 McKinsey, C of N and S lines and 150 ft. from W of 100-ac. tract, Wm. Daniels Sur.
S.D. 1,257 ft.

Martin & Evans' No. 1 Bryant, 433 ft. N of same operators' dry hole, Nacogdoches County School Land Sur.
Rigged up.

Miller et al's No. 1 J. M. Palmer, 150 ft. from S and E lines of 69-ac. tract, Nacogdoches County School Land Sur.
S.D. 700 ft.

Peden and Olson's No. 1 J. M. Palmer, 200 S of No. 2 and 140 ft. from W line of tract, J. Goodman Sur.
T.D. 2,138 ft.

M. Rouch et al's No. 1 Bearden & Palmer 150 ft. out of SE cor. of 61-ac. tract. Nacogdoches C.S.L.
S.D. 1,237 ft.

Southwest Texas Wildcats

(Continued from Page 136)

GOLIAD COUNTY

Magnolia Pet. Co.'s No. 1 Albrecht, 660 ft. N line, 330 ft. SW line of J. P. Reid Sur.
Derrick.

Oceanic Pet. Co.'s No. 1 Fromme, 1,500 ft. S line, 1,200 ft. W line of 62-ac. tract in P. D. Dexter Sur., 10 miles N of Goliad.
T.D. 2,685 ft.; to set casing.

GUADALUPE COUNTY

Cole Pet. Co.'s No. 1 John D. Puckett, 330 ft. from N and W lines of Share 296, Sal Salvador del Tule grant.
Location abd.

Diamond Half Oil Co.'s No. 1 Wm. Maiserhofer, 506 ft. from E line and 1,500 ft. from N line of 51.85-ac. tract in L. H. Peters Sur.
Drlg. Georgetown 2,115 ft.

L. E. Trout's No. 1 McKee, Green DeWitt Sur., SW Darst Creek.
S.D. 1,200 ft.; no report.

HIDALGO COUNTY

Danvers-Harrison et al's No. 1 Guerra, 330 ft. out of SW cor. of 40-ac. tract, Blk. 12, Porcion 41.
Cored saturated sand 2,734-40 ft.; set csg. without making test.

Davis & Harrison's No. 1 Lula George, 302 ft. from S and 700 ft. from E lines of Tract 13, Porcion 41, Ancient Jurisdiction of Reynosa.
T.D. 4,135 ft.

John Deering et al's No. 1 John C. Engleman, 400 ft. S and W lines, Lot 3, Blk. 79, Mestenas tract.
Drlg. hard shale and lime 5,564 ft.

Downey & Morton's No. 1 Doskam, 450 ft. from E line, 55 ft. from S line of Blk. 34, Por. 45.
S.D. for repairs.

Union Sulphur Co.'s No. 2 American Rio Grande L. & I. Co., 400 ft. from S and E lines of tract, Blk. 86, North Capisallo district.
No report.

JIM HOGG COUNTY

John D. Norwood's No. 1 C. W. Hellen, 330 ft. N and W lines, Sur. 48.
T.D. 1,260 ft. (corrected); standing.

J. M. Shugart's No. 1 R. Holbien, 100 ft. from N line, 330 ft. from S line of Blk. 55, Sur. 17 of Holbien Subd., of Las Animas grant.
Spudded in and set surface csg.

Sun Oil Co.'s No. 1 A. L. East, 660 ft. from N and E lines of Blk. 4, Sur. 32.
Location.

JIM WELLS COUNTY

Plymouth Oil Co.'s No. 1 Cuero Cattle Co. 330 ft. from S and W lines of H.T.&B. Sur. No. 7, 21½ miles W from Alfred.
No report.

Smith & Storey's No. 1 Martha E. Ellworth, 330 ft. N and W from SE cor. of W half of W 426 acres of Stanley Welch Sur.
Drlg. 5,360 ft.

KARNES COUNTY

California Oil Co.'s No. 1 J. C. Tom, Jr. 466 ft. each way from NW cor. of 6,526-ac. tract, Maria-De Jesus Y. Barbo grant, Abd. 4,700 ft.

F. P. Hynes et al's No. 1 Swiercy, 2,650 ft. from NW line, 500 ft. from SW line of 100-ac. tract in Gasper Flores Sur.
T.D. 2,183 ft.; preparing to core for Queens City sand.

R. E. Cezeaux et al's No. 1 Tom Campbell, 330 ft. S and E cor. of farm and survey, J. R. Backer Sur., 12½ miles SW of Falls City.
S.D. 1,254 ft.

Marra et al's No. 1 M. E. Choate, 330 ft. out of NW cor. of 128-ac. tract, Johnson Sur.; elev. 382 ft.
Drlg. 2,700 ft.

KENDALL COUNTY

Walter Bradley's No. 1 Warner, John F. Torrey Sur.
S.D. 919 ft.

W. R. Shanklin's No. 1 Seidenstick, 1,835 ft. from most easterly E line, 100 ft. from most northerly S line of Antonio Rodegues Chacon Sur. 257.
S.D. 400 ft.

KERR COUNTY

Edmiston Oil Corp.'s No. 1 Whitworth, 1,160 ft. from S line and 1,333 ft. from E line of Sec. 1,429 of the H.E.&W.T. Sur.
S.D. 675 ft.

Herbert Oil Co.'s No. 1 J. D. Witt, 13,200 ft. from N line, 1,200 ft. from W line of Sec. 1,923, Hamilton Sur.
S.D. 1,896 ft.

Jeff Love and Eastland Oil Co.'s No. 5-B Jeff Love, 1,500 ft. SE of No. 1 and 1,580 ft. from SE cor. and 300 ft. from N line of Sec. 1,591.
T.D. 2,465 ft.; waiting on orders.

J. F. Morrissey et al's No. 1 F. A. Karge, 1,400 ft. from S line and 600 ft. from E line of survey, Sec. 1, B.S.&F. Sur.
Drlg. 1,500 ft.

G. F. Schreiner's No. 3 Jeff Love, 1,444 ft. from W line, 1,194 ft. from S line of Sur., 660 ft. N and 100 ft. E of Evans & Ganis' No. 1 Love, Martinez Sur. 1,594.
Dropped from report.

LA SALLE COUNTY

Standard Oil Co. of D. C.'s No. 1 J. M. Martin, 300 ft. S and W lines of 642-ac. farm in Sur. 682.
Drlg. 2,255 ft.

LEE COUNTY

Jas. E. Pederson's No. 1 Turner, David Hudson Sur.
Running csg. 6,330 ft.

LIVE OAK COUNTY

Coquat's No. 1 Wade McNeil, 1½ miles NW McNeil discovery well.
Drlg. below surface csg.; no report.

W. H. Helmerich's No. 1 Cartwright, 660 ft. from W line, 330 ft. from S line of Lot 16, Seale, Morris & Seale Sur.
Location.

Henderson Coquat et al's No. 1 Robertson, Sec. 314.
Drlg. 3,100 ft.; no report.

Henderson Coquat et al's No. 1 Little, 1,320 ft. NE of S cor. of M. M. Shipp Sur. and 330 ft. N of S line.
Drlg. 1,100 ft.; no report.

MAVERICK COUNTY

Mike Chorgas et al's No. 1, on edge of municipal airport at Eagle Pass.
Drlg. 80 ft.

McMULLEN COUNTY

Armoil Prod. Co.'s No. 2 K. Martin, Sur 483.
Location abd.

Beer-Witherspoon's No. 1 Ezzell, 330 ft. from N and W lines of 40-ac. tract in Fant & Fadden Sur.
Drlg. 1,152 ft.; no report.

Bolin's No. 1 Brown, 1,500-ac., NW Crowther field.
Location. Contract calls for 1,000 ft. test.

H. K. Boysen's No. 1 Haglst, 990 ft. S, 330 ft. W of NE cor. Sec. 10, H.&T.C.R.Y. Sur.
Drlg. 1,205 ft.

Byron Rife's No. 1 Edrington, 330 ft. from S and W lines of Sec. 79.
Location.

Circle W Oil Co.'s No. 1 Wheeler, NW cor. Sec. 44, of Two Rivers Ranch Subd.
Coring 1,165 ft.; no report.

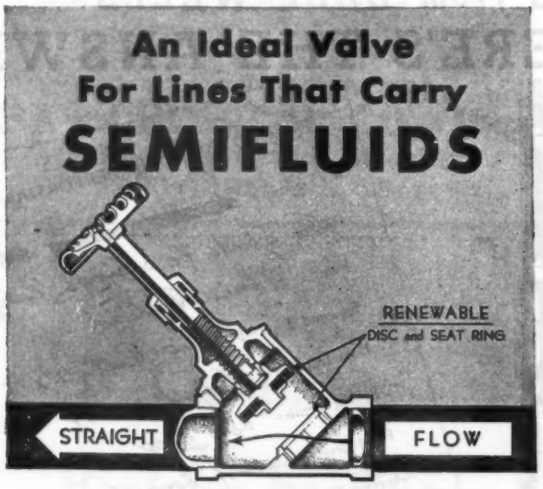
Choate & Noble's No. 1 Miles, 330 ft. from S line, 2,750 ft. from E line of 1,250-ac. tract in Stephens Sur.
Location.

Howard's No. 1-A Claunch, 90 ft. E line, 700 ft. S line of tract in M. Healy Sur.
T.D. 780 ft.; coring; no report.

C. C. Shumway's No. 3 Shiner.
Rig up.

Charles Wuest's No. 1 Fisher, Roderick O'Boyle Sur.
Derrick.

Hy Yound's No. 1 Callihan, James Gardner Sur., NW cor. Blk. 4, Sec 6.
Derrick.



Jenkins Fig. 124 Standard Bronze Y Valve

OILS and other viscous fluids, will flow through a Jenkins Y Valve with minimum loss of head. The design of this valve provides for a straight-through passage practically in line with the pipe. There are no sharp bends to cause high fluid friction.

A Jenkins Y Valve also offers a decided advantage where valves must be located in cramped places. The spindle at a 45 degree angle makes the hand wheel easily accessible, even where the valve is installed very close to tanks, holders, walls, etc.

Fitted with a Jenkins Renewable Seat Ring, this valve is easier to keep tight and requires practically no attention. Regrinding is never necessary. The sectional view shown above is a Fig. 124 Jenkins Standard Bronze Y or Blow-Off Valve. Other patterns include Extra Heavy Bronze, Special Hard Bronze, and Standard and Extra Heavy Iron Body with Bronze mounting, screwed or flanged. Stocks are carried by good supply houses everywhere. For further details, write for Bulletin 104, or consult the new Jenkins Catalog.

JENKINS BROS., 80 White Street, New York, N.Y.; 510 Main St. Bridgeport, Conn.; 524 Atlantic Avenue, Boston Mass.; 133 No. Seventh St., Philadelphia, Pa.; 822 Washington Boulevard, Chicago, Ill.; JENKINS BROS., Limited, Montreal, Canada; London, England

Jenkins Valves

BRONZE—IRON—STEEL SINCE 1864

MEDINA COUNTY

C. M. Peacock's No. 1 Odem, 160 ft. from W line, 200 ft. from S line of Castro Sur. No. 173-174.
Location.

Scoggins & Sanders' No. 1 L. W. Burrell, 150 ft. from E line, 1,750 ft. from N line of M. E. Gage Sur. 395.
Drlg. 1,815 ft.

MILAM COUNTY

Frank W. Keller, Inc.'s No. 1 A. L. Lucas, 1,980 ft. from N line, 400 ft. from E line of 178.5-ac. tract in J. Real Sur.
Location.

Second Natl. Bank's No. 1 B. P. Ward, 150 ft. SW line, 950 ft. SE line of 100-ac. tract, L. Taylor Sur.
Drlg. 1,210 ft.

NUECES COUNTY

Buff Pet. Co.'s No. 1 Vincent Bluntzer, 660 ft. N line, 660 ft. E line of Share 7 of Bluntzer Subd.
Rigging.

Clymore Oil Co.'s No. 1 Palo Alto Farms, 2,640 ft. from N and E lines of Sec. 132 of Bishop Subd.
Derrick.

Texon Royalty Co.'s No. 1 Robert Driscoll, 330 ft. from N line, 5,697 ft. from W line of 880-ac. Driscoll tract and E of Simmons & Perry tract.
Rig up.

REAL COUNTY

M. J. Heartwell et al's No. 2 L. J. Haby, 694 ft. from W line and 2,153 ft. from S line of A.B.&M. Sur. No. 175.
Drlg. 2,837 ft.

SAN PATRICIO COUNTY

Allied Minerals' No. 1-A Ramsey, 466 ft. E, 220 ft. N of SW cor. of the North B. Giddings Sur. on a 1,000-ac. tract.
Sandy shale 2,462 ft.; moving in heavier rig.

Lonnie Glasscock's No. 1 M. F. Timmons, 330 ft. out of SE cor. of Blk. 27, San Patricio townsite.
Drlg. 5,300 ft.; to make a D.S. test at 4,700 ft.

Gum Hollow Oil Co.'s No. 1 J. G. Willacy, 2 mi. W Portland.
Abd. 6,539 ft.

STARR COUNTY

Cooper & Andrews' No. 1 J. M. Martinez, SW cor. Sec. 135.
Location.

C. R. Borah's No. 1 A. Guerra, San Jose grant, 330 ft. from N and 150 ft. from E line of Sec. 6 (NE part of county).
Drlg. 2,230 ft.

E. P. Evans' No. 1 Kelsey Bass, 330 ft. N of State Highway 4, Sec. 7, Subd. Porcions 75, 76 and 77.
Abd. 2,025 ft.

Lester & Duffield's No. 1 Carruth, 3,600 ft. S line, 3,300 ft. W line of Share B-1, Porcion 91-92.
Location.

C. L. Smith et al's No. 1 J. M. Longfellow, 330 ft. out of NW cor. of Sur. No. 281.
Drlg. 1,345 ft.

Heep Oil Co.'s No. 1 Guerra, 330 ft. from NE and SE lines of Blk. 35, J. N. Crawford Subd., Porcion 56, Jurisdiction of Mier.
Rigging up.

Smith & Weston's No. 1 M. M. Garcia, Blk. 9, Sur. 908.
Location.

Sun Oil Co.'s No. 1 Gonzales & Clark, 600 ft. out of NW cor. of NE Sec. 372, T.T. Ry. Sur. No. A-773.
Drlg. 3,000 ft.

United Prod. Co.'s No. 1 Guerra, 36, 170 ft. from NE line, 1,521 ft. from NW line of Porcion 66.
Drlg. sandy shale 2,335 ft.

E. L. Younkin's No. 1 Kelsey Bass, 330 ft. from S line, 7 ft. from W line of Blk. 19, in Porcion 87.
Drlg. 2,240 ft.

TRAVIS COUNTY

Marts & Beavens' No. 1 Emil Bloomquist, 150 ft. from NW line and SW line of 99½-ac. tract in Peter C. Harrison Sur.
S.D. 1,300 ft.

UVALDE COUNTY

Humble Oil & Ref. Co.'s No. 1 R. L. Anderson, 7,450 ft. SW of NE line and 9,100 ft. SE of NW line of J. J. Guerra Sur. (3 mi. NE of Uvalde).
Drlg. 4,925 ft.

T. T. Word's No. 1-B Truelove, 45 ft. E of No. 1-A.
Setting csg. 3,025 ft.

WEBB COUNTY

Detterhaim & Jones' No. 1 M. Jones, 600 ft. E line, 1,620 ft. S line of Sur. 1,640.
Drlg. 455 ft.

W. W. Lincoln's No. 1 M. B. Volpe, 3,800 ft. N, 150 ft. W line of Sur. 2,011.
Abd. 3,015 ft.

W. P. Morris' No. 1 A. M. Bruni, 994 ft. NW line, 943 ft. NE line, Blk. 65, G. M. Brown Subd. Saltea pasture, in J. V. Borrego grant.
Abd. 1,750 ft.

Payne et al's No. 1 Hoggterp, Blk. 6, Sur. 1,110, W of Oilton.
Location.

WILLACY COUNTY

W. W. Silk's No. 1 Stillman, Lot 16, Blk. 30, Santa Rosa Subd., Share 44.
Drlg. 2,000 ft.

WILLIAMSON COUNTY

Johnson & Ray's No. 1-A Mary Smith Oxford, 350 ft. S, 40 deg. E of No. 1, Williams Sur.
Drlg. 715 ft.

Mann & Roez et al's No. 1 F. Roez, John Bevil Sur. 56.
S.D. 1,025 ft.

T. J. McConnell's No. 1 J. R. Nazier, 150 ft. from S line and San Gabriel River and 150 ft. from E line of 124-ac. tract in Zarzo Sur.
T.D. 675 ft.; standing in chalk.

J. A. Morgan Russell's No. 1 Nelson Est., 150 ft. S line and 1,115 ft. E line of J. L. Justin No. 2 Sur., 5 miles S of Georgetown.
Abd. 800 ft.

J. Morgan Russell's No. 2 Nelson, 3,200 ft. from CEL of W. Donaho Sur. No. 117, 1,600 ft. from CSL.
Drlg. Georgetown 280 ft.

Stalley & Cafty's No. 1 A. J. Nelson, 350 ft. from SE line and 150 ft. from NE line of Barney C. Love Sur.
T.D. 355 ft.; H.F.W.; no report.

WILSON COUNTY

Ray Oil Co.'s No. 1 J. M. McDaniel, 1,700 ft. from SW line, 350 ft. from NW line of 193.5-ac. tract in Concepcion Bostello Sur. No. 9.
Rigged up and S.D.

J. C. Yancey's No. 1 Lyssy, 300 ft. from SE and SW lines of lease in D. J. Holt Sur.
T.D. 1,600 ft.; S.D. in shale.

ZAPATA COUNTY

C. C. Crews' No. 1 M. D. Slater, 2,111 ft. from SW line, 1,950 ft. from SE line of Blk. 1, Mission Oil Co. Subd. of Slater ranch, Borrego grant.
T.D. 1,739 ft.; standing.

Danvers & Harrison's No. 1 M. J. Vela, 630 ft. NE line and 300 ft. NW line, or 3,140 ft. E line and 330 ft. N line of Por. 29, Blk. 7, Bela Subd.
T.D. 1,603 ft.; washing to bottom.

J. W. Edwards' No. 1 D. A. McAskill, 150 ft. from N and E lines of Blk. 62, J. W. Edwards Subd. of 4,069.6-ac. tract out of Corralitz Subd. of the J. V. Borrego grant.
Abd. 2,005 ft.

Merle Gunby's No. 3 Alice D. Haynes, 200 ft. SE and NE lines, Blk. 9, Haynes Subd., Comitas and Villa grant.
Drlg. 2,725 ft.

H. & M. Drlg. Co.'s No. 1 Slater, 614 ft. from SW line, 150 ft. from SE line, Blk. 65, J. B. Borrego grant.
T.D. 22 ft.; standing.

Howell Muckelroy's No. 1 Filemn Flores, 77 ft. from SE line on NE line Lot 2, Blk. 30, Por. 37.
Derrick.

A. H. Wray's No. 5 Gopher Trust, 330 ft. NE and NW lines of Blk. 12, Sur. 1, San Ignacia Subd., Borrego grant.
Spudded in.

E. P. Wells' No. 1 S. E. Garcia, 150 ft. from N and E lines of 200-ac. tract in Pedernal grant.
Location abd.

Southwest Texas Proven

Week Ending November 10

NORTH DALE POOL—BASTROP COUNTY

Cole Pet. Co.'s No. 1 Rubin Gage, NE cor. of tract, 150 ft. each way from corner.
Location.

Joe E. Mills' No. 1 Mrs. W. J. Cardwell, 900 ft. from SE line, 1,200 ft. from SW line of tract, J. A. Navarro Sur.
Rigging up and S.D.

Joe E. Mills et al's No. 1 Wm. Litton, 620 ft. from SE line, 850 ft. from SW line of 320-ac. tract in Navarro Sur.
T.D. 1,753 ft.; standing; showing for small well.

Porter and Neal's No. 1 J. F. Wolff, 150 ft. from NE line, 2,800 ft. from SE line of F. Edmundston Sur.
Spudded and S.D.

NORTH PETTUS FIELD—BEE, GOLIAD AND KARNES COUNTIES

Houston Oil Co.'s No. 7-B Niehaus, 660 ft. SE of No. 4-B, Talley Sur.
Coring sticky shale 3,804 ft.

Houston Oil Co.'s No. 9-B Niehaus, 660 ft. SE of No. 6-B, B.S.&F. Sur.
Location.

United Prod. Co.'s No. 47 Ray, 300 ft. NW from SW cor. of Houston Oil Co.'s Neihaus "B" lease along Neihaus-Ray property line, thence 330 ft. in SW direction at R/A to previous course.
Ran Schlumberger 3,958 ft.

Diamond Half Oil Co. et al's No. 3 Grady Smith.
Drlg. plugs 3,638 ft.

TULETA—BEE COUNTY

E. M. Jones' No. 1 Skinner & Harris, 330 ft. from N and W lines of E 80-ac. of NW of Sec. 10 Ragsley Subd. of Uranga grant.
Spudded in and set surface csg.

Mills Bennett's No. 1 Harris, 330 ft. out of SE cor. NW Sec. 9, Ragsley Subd., Uranga grant.
T.D. 3,922 ft.; I.P. 110 bbls. per day on ¼-in. choke; 1,250 lbs. tubing pressure; 1,500 lbs. csg. pressure.

Mills Bennett's No. 1 Silcock, 330 ft. S and W of NE cor. Sec. 9, Uranga grant.
Rigging up.

Mills Bennett's No. 1 Tuleta Mercantile Co., 330 ft. from N and W lines of SW Sec. 10. Bldg. derrick.

Whisenant & Trenchard's No. 2 Rapp, 330 ft. from N and E lines of N½ NW NE Sec. 10.
T.D. 3,900 ft.; comp.; but no gauge.

HOCH—BEXAR COUNTY

H. J. Trawalter's No. 7 fee, 150 ft. from N line, 450 ft. from E line of 202-ac. tract in S. Jett Sur. No. 53.
Drlg. 450 ft.

VON ORMY—BEXAR COUNTY

W. L. Umburn's No. 1 Bilharts, in SW cor. of tract, offsetting Strumberg well, F. Rolen Sur.
No report.

DALE—CALDWELL COUNTY

W. B. Hinton's No. 1 Osteen, 150 ft. SW line, 450 ft. NE line of 70-ac. tract in Swearinge Sur.
Drlg. 515 ft.

EAGLE HILL—DUVAL COUNTY

Tide Water Oil Co.'s No. 1 J. R. Foster, 1,650 ft. from S line and 165 ft. from E line of Sur. 200.
Abd. 2,239 ft.

GOVERNMENT WELLS POOL—DUVAL COUNTY

Brown & Nessly's No. 3 Runnels, 330 ft. S line, 990 ft. W line of NE NW Sur. 62. Sand 2,349-56 ft.; T.D. 3,456 ft.; W.O.C.

Brown & Nessly's No. 4 Runnels, 330 ft. E and N line of NE NW Sur. 62.
Location.

Edna Bryant et al's No. 1 J. W. Kidd, 430 ft. S line, 315 ft. E line of Sur. 56.
Drlg. 1,905 ft.

Edgington & Murry's No. 2 Winch & Henne, 330 ft. from E line, 990 ft. from N line, Blk. 15, Sur. 250.
T.D. 2,376 ft.; W.O.C.

Felix Oil Co.'s No. 2 Curry, 330 ft. S line, 990 ft. W line of N½ SW of Sur. 62.
Location.

Government Wells Oil Corp.'s No. 6 State, 330 ft. from N line, 1,650 ft. from W line of Sur. 60.
Testing sand 2,193-2,248 ft.

K. F. Hasselman's No. 3 Moody, 220 ft. from W line, 150 ft. from S line of S half SW of Sur. No. 60.
Location abd.

Humble O. & R. Co.'s No. 36 C. W. Hahl, 990 ft. N line, 2,310 ft. W line of Sur. 360.
T.D. 2,323 ft.; I.P. 53 bbls. per hr. on ¾-in. choke.

Humble O. & R. Co.'s No. 49 Paul White, 990 ft. E line, 330 ft. N line of Sur. 50.
T.D. 2,395 ft.; comp. 8 bbls. per hr.

Magnolia Pet. Co.'s No. 1 D.C.R.C., 330 ft. S and E lines of Sur. 57.
Location.

Magnolia Pet. Co.'s No. 40 D.C.R.C., 990 ft. W line, 2,310 ft. N line of Sur. 209.
Moving in material.

Magnolia Pet. Co.'s No. 3-C Hahl, 330 ft. S and E lines of Sur. 61.
T.D. 2,369 ft.; I.P. 100 bbls. per day on pump.

Magnolia Pet. Co.'s No. 1 Hahl-Rogers, 330 ft. N and W lines of W½ NE of Sur. 61.
Sand 2,283-99 ft.; 7-in. csg. 2,293 ft.; W.O.C. 2,299 ft.

Magnolia Pet. Co.'s No. 8 Hahl-Southerland, 330 ft. S line, and W line of NW, Sur. 61.
T.D. 2,305 ft.; I.P. 8 bbls. per hr. on ¼-in. choke; flowing.

Magnolia Pet. Co.'s No. 2 Hahl-Norton, 330 ft. S and W lines of Sur. 61.
Rig.

Magnolia Pet. Co.'s No. 3 Hunt, 330 ft. S line and 350 ft. W line, SE of Sur. 46.
Cmtd. 7-in. csg. 2,343 ft.; sand.

Magnolia Pet. Co.'s No. 10-A C. W. Hahl, 330 ft. S and W lines of S½ SE Sur. 45.
T.D. 2,310 ft.; I.P. 200 bbls. per day on pump.

Magnolia Pet. Co.'s No. 39 D.C.R.C., 990 ft. W line, 2,310 ft. S line of Sur. 209.
T.D. 2,328 ft.; I.P. 10 bbls. hr.; flowing.

Magnolia Pet. Co.'s No. 1 Emil Labbe, 330 ft. S and W lines of Sur. 2.
Derrick.

Magnolia Pet. Co.'s No. 4 A. L. Tankersley, 330 ft. S line, 250 ft. E line of SW of Sur. 46.
Location.

Magnolia Pet. Co.'s No. 10 J. O. Wilson, 330 ft. N and E lines of Sur. 348.
Location.

Reynosa Oil Co.'s No. 9 D.C.R.C., 330 ft. E line, 430 ft. N line of N½ SW of Sur. 362.
Drlg. 1,000 ft.

Russ Pet. Co.'s No. 3-C Hahl, 260 ft. E line, 370 ft. N line of NW of Sur. 62.
T.D. 2,332 ft.; jetting 50 bbls. per day.

Russ Pet. Co.'s No. 4-C Hahl, 330 ft. N and E lines of SW NW of Sur. 62.
Drlg. 310 ft.

Smith & Storey's No. 11 Lundell, 330 ft. S and W lines of Sur. 2.
T.D. 2,218 ft.; W.O.C.

Smith & Story's No. 12 Lundell, 330 ft. S line, 990 ft. W line of Sur. 48.
Location.

Sun Oil Co.'s No. 72 Weiderkehr, 660 ft. S of No. 70 on 3,085-ac. tract in Sur. 359.
Rig.

Sun Oil Co.'s No. 3 Henne-Winch, 330 ft.

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Drlg. 2,340 ft.

E. R. Thoas' No. 1 Bishop Cattle Co., 2,325 ft. E line, 330 ft. N line of S½ of Sur. 135.
Location.

Trapshooter Reilly's No. 3-B C. W. Hahl, 330 ft. S line, 750 ft. E line of Blk. 27, Sur. 250.
T.D. 2,365 ft.; I.P. 38 bbls. per day on pump.

PIEDRAS PINTAS—DUVAL COUNTY

Tom Graham and Texon Royalty Co.'s No. 3 Parr, 2,170 ft. N line, 2,250 ft. E line, 150 ft. S of No. 1, Sur. 135.
Location abd.

LUCAS—LIVE OAK COUNTY

Lion Oil & Ref. Co.'s No. 2 McNeil, J. Curry Sur., 660 ft. N of No. 1.
Drlg. 5,580 ft.

Houston Oil Co.'s No. 28 Cartwright, 1,000 ft. S of No. 27, and 112 ft. E of railroad.
Skidded derrick to new location.

DARST CREEK—GUADALUPE COUNTY

Grayburg Oil Co.'s No. 1 Mrs. S. M. Roamel, 491 ft. N line, midway between W and E lines of 50-ac. lease.
T.D. 2,510 ft.; running 6⅝-in. csg.; D.S. test showed oil; treating chalk with acid.

SAM FORDYCE—HIDALGO COUNTY

W. E. Butler's No. 1 F. B. Guerra, 93 ft. N line, 294 ft. S and W lines of 2.5-ac. tract in Tract 254, Por. 39-40.
Location.

Circle W Oil Co.'s (Navarro) No. 1 Seabury, George & Taylor, 330 ft. S and E lines of SE 51-ac. tract in Tract 256, Por. 38.
Derrick completed.

Jack Clements' No. 1 Felipe Farias, 150 ft. from N and E lines of Share 273, Por. 39. Reynosa.
Derrick.

Cosmo Pet. Co.'s No. 1 F. B. Guerra, 330 ft. W line, 130 ft. N and S lines of N 25-ac. of S 100-ac. of E 290-ac. of Tract 254, Por. 39-40.
Location.

Danvers-Harrison & Davis' No. 1 Dr. Austin, center of E 7.2-ac. of S 14.4-ac. in Share 282, Por. 39.
Location.

Edwards & Olford's No. 1 E. Flores, 330 ft. N line, 126 ft. E line of Tract 267, Por. 38.
T.D. 2,807 ft.; drilled plugs and running tubing to comp.

M. Porter Evans' No. 1 John W. Lawrence, 330 ft. from N and W lines of W 19.04-ac., Share 274, Por. 39.
Location.

Porter Evans' No. 1 David Flores, Tract 262, Por. 38.
S.D. 2,230 ft.

Heep Oil Co.'s No. 1 W. R. Jackson, 344 ft. E and W lines, Tract 278, oPr. 39-40.
Drlg. 2,750 ft.

Heep Oil Co.'s No. 1 Guerra, 330 ft. from W line, 185 ft. from N line of 25-ac. tract in Por. 40.
Drlg. 2,200 ft.

R. C. Horne's No. 1 F. B. Guerra, 93 ft. S line, 294 ft. E and W lines of NW 2.5-ac. tract in S 125 acres of E 290 acres of Tract 254, Por. 39-40.
Location.

T. I. Larson's No. 1 G. G. Salinas, 330 ft. S and W lines of Share 10, Por. 41.
Moving in material.

Lucky, Blocker & Bishop's No. 2 F. B. Guerra, 300 ft. S line, 2,511 ft. W line of Tract 254, Por. 39.
Drlg. 1,505 ft.

Moncrief & Showers' No. 1 John Lawrence, on 9.52-ac. tract.
Sand 2,772-84 ft.; cmtd. csg.

Moncrief & Showers' No. 2 John Lawrence, 305 ft. N line, 241 ft. E line of 13.5-ac., Tract 274, Porcion 39.
Moving in derrick.

Reynosa Oil Co.'s No. 1 Guerra, 330 ft. from W line, midway between N and S lines of NW 10-ac. of SW 40 acres of Tract 254, Porcion 39.
Machinery on ground.

Reynosa Oil Co.'s No. 1 P. S. Rivas, 330 ft. from N line, 255 ft. from W line of N 30-ac., Tract 393, Por. 39.
Location.

H. B. Simms' No. 1 Guadalupe, F. V. de Rivas, 129 ft. N and S lines, 209 ft. E and W lines of Lot 101, Tract 349, Por. 40.
Location.

Ed Sullivan's No. 1 E. B. Guerra, center of NE 10.77 acres of SW 40.7 acres of Tract 254, Por. 39.
Location.

Ed Sullivan's No. 1 E. Flores, 330 ft. N line, 107 ft. E and W lines of Tract 266, Por. 38.
Location.

Van Dresar et al's No. 1 W. R. Jackson, 330 ft. from N and W lines of 92-ac. tract, Por. 38-39-40, Blk. 273.
Location.

Otto Woods' (Kingwood) No. 1 Flores, 150 ft. E line, 296 ft. S line of Tract 262, Por. 38.
T.D. 2,780 ft.; drilled plugs and run tubing.

Otto Woods' No. 1 F. B. Guerra, 1,700 ft. NW of discovery well.
Cored sand 2,794-2,804 ft.; cmtd. liner.

Otto Woods' (Kingwood) No. 3 F. B. Guerra, 300 ft. S line, 1,077 ft. W line, Tract 254, Por. 39.
Drlg. 900 ft.

Otto Woods' (Kingwood) No. 4 F. B. Guerra, 330 ft. S and E lines of NW 30 acres of S 150 acres, Tract 254, Por. 39.
Location.

Otto Woods' No. 3 John Lawrence, 330 ft. from S and W lines of W 40 acres of Tract 274, Por. 39.
Ready to spud.

Otto Woods' No. 4 John Lawrence, 330 ft. from E line, 350 ft. from S line of W 40 acres, Tract 274, Por. 39.
Rigging up.

Windsor Oil and Circle W Oil Co.'s No. 1 J. H. Doss, 330 ft. from N and W lines of 55 acres or in Tract 278, Por. 40.
Location.

JACOB POOL—McMULLEN COUNTY

American Gas Co.'s No. 1 L. Jacobs Corp., 350 ft. W of SE cor., 160 ft. SE line of tract in Facden Sur.
Spudded and S.D.

C. R. Kennon's No. 4 H. L. Lark, 175 ft. from S line, 175 ft. from W line of E 20-ac. of Blk. 15 of Scrugham Sur.
Location.

C. R. Kennon's No. 5 H. L. Lark, 175 ft. from S and E lines of E half of Blk. 15 of Scrugham Sur.
Location.

Loma Oil Co.'s No. 30 Jacob, 660 ft. S, 330 ft. W of NE cor. Sec. 10, H.&T.C.R.R.Y. Sur.
Drlg. plugs 964 ft.

Loma Oil Co.'s No. 1 H. E. Palmer, 330 ft. E, 3,000 ft. S line, Sparks Sur.
Abd. 1,780 ft.

Stewart & Holding Co.'s No. 3 Jacob, 660 ft. S and 660 ft. E of No. 2, John Fadden Sur.
T.D. 895 ft.; S.D.

Sunland Oil Co.'s No. 1 H. L. Lark, W. H. Jacob Sur. No. 8.
T.D. 1,026 ft.; I.P. 4 bbls. per day on pump.

R. P. Whitefield's No. 1-A Jacob, 1,800 ft. from W line, 1,200 ft. from S line of SW of Sur. 17.
Temp. abd. 1,135 ft.

R. P. Whitefield's No. 3 Jacob, 240 ft. E line, 275 ft. S line of 70-ac. tract out of NE cor. Sec. 9, 314 ft. S of No. 1.
Drlg. 250 ft.

SINTON—SAN PATRICIO COUNTY

Heep Oil Corp.'s No. 3 R. Welder, 466 ft. from S line, 2,000 ft. from E line of Adeline Welder tract in Victor Loupsey Sur.
Derrick.

Heep Oil Corp.'s No. 4 R. Welder, 466 ft. from S and W lines, 360-ac. tract, Victor Loupsey Sur.
T.D. 7,220 ft.; fishing.

Plymouth Oil Co.'s No. 2-B Welder, start at SW cor. of "B" lease, thence NW along the W line 2,100 ft., thence 350 ft. NE at R/A.
W.O.C. 1,394 ft.

Plymouth Oil Co.'s No. 3-A Wheeler.
Location.

JEFFRIES-LAMBETH—STARR COUNTY

Weekly Oil Co.'s No. 2 S.C.C.C., 330 ft. from S and W lines of Blk. 19, Porcion 89.
Drlg. 2,742 ft.

LOS OLMOS—STARR COUNTY

J. P. Kennedy's No. 3 Kelsey-Bass, 200 ft. SE of No. 7 Kelsey-Bass in Blk. 7 of Porciones 75, 76 and 77.
Location.

CUEVITAS POOL—STARR COUNTY

Sun Oil Co.'s No. 5-C M. Guerra & Son, 1,320 ft. NE of No. 4-C La Sacatosa grant.

AGUA DULCE—NUECES COUNTY

Clymore Prod.'s No. 3 Ingram, 660 ft. from E and S lines, Sec. 6, Blk. 6, Peters Subd.
Drlg. 6,[illegible] ft.

Clymore Prod. Co.'s No. 3-D Ingram, 660 ft. from S and W lines of Lot No. 7, Sec. 6, Peters Subd. No. 3.
Location.

Clymore Prod. Co.'s No. 1-C Ollie Purl, 660 ft. N and E lines of Lot No. 2, Sec. 7, Peters Subd. No. 3.
Moving in rig.

SAXET—NUECES COUNTY

Southern Mineral Corp.'s No. 4 Ocher, 1,200 ft. S line and 417 ft. E line of Ocher 202.52-ac. tract in Sec. 8.
Location.

KIMBRO—TRAVIS COUNTY

Humble O. & R. Co.'s No. 2 Buck Christian, 330 ft. SE cor. tract, Kemp Sur.
T.D. 827 ft.; I.P. 4 bbls. per day.

Humble O. & R. Co.'s No. 2 Peterson, 330 ft. NE and SE lines of 127-ac. tract.
Coring 746 ft.

WEST COLE POOL—WEBB COUNTY

American Liberty Oil Co.'s No. 4-A Bruni, 777 ft. SW line, 1,593 ft. SE line of Sur. 6, Foltz Subd., Arispe grant.
Fishing 3,400 ft.

American Liberty Oil Co.'s No. 6-A Bruni, 330 ft. NW line, 1,003 ft. SW line of Sur. 6.
T.D. 3,414 ft.; cmtd. 7-in. csg. at 3,387 ft.

American Liberty Oil Co.'s No. 2-B Bruni, 418 ft. NE line, 260 ft. NW line of Blk. 12, Sur. 5.
Drlg. 3,005 ft.

Herman Brown's No. 3 Bruni Est., 343 ft. NE line, 260 ft. SE line of Blk. 2, Sur. 5, Arispe grant.
Sand 3,405-32 ft.; W.O.C.

Cole Pet. Co.'s No. 87 R. Benavides, 990 ft. SE line, 330 ft. SW line of Sur. 1.
T.D. 3,431 ft.; P.B. to 2,400 ft.

French Oil Co.'s No. 1 Perez, 330 ft. E line, 2,310 ft. N line of Sur. 460.
Drlg. 3,250 ft.

Kalmore's No. 1-B Bruni, 330 ft. to W line, 418 ft. SW line, Blk. 23, Sur. 5, Adams Subd., Mariano Arispe grant.
No report.

O. W. Killam's No. 28 Bruni, 1,437 ft. NE line, 2,172 ft. SE line, Blk. 6.
T.D. 3,405 ft.; I.P. 40 bbls. per hr.; flowing.

O. W. Killam's No. 29 Bruni, 1,237 ft. SE line, 1,950 ft. SW line of Share 6, Arispe grant.
Rigging up.

Sun Oil Co.'s No. 2 Bruni, 418 ft. NE line, 260 ft. SE line, Blk. 9, Sur. 5.
No report.

Starr State Oil Co.'s No. 11 Yeager, 200 ft. S line, 450 ft. E line of 632-ac. tract in Share 5 of Los Animas grant.
Fishing 3,418 ft.

BYERSVILLE—WILLIAMSON COUNTY

G. L. Rowsey's No. 2 Heep, 450 ft. SW line, 2,750 ft. from creek, H. White Sur.
Location.

G. L. Rowsey's No. 1 Lange, 150 ft. SW line, 1,900 ft. N of creek, Hamilton White Sur.
No report.

G. L. Rowsey's No. 2 Lange, 2,850 ft. from creek, H. White Sur.
Location.

G. L. Rowsey's No. 1-C Sladek, 150 ft. NE line, 2,621 ft. N of creek in H. White Sur.
T.D. 865 ft.; showing oil; still cleaning itself.

G. L. Rowsey's No. 2-C Sladek, 150 ft. NE line, 2,921 ft. N of creek, H. White Sur.
Drlg. 480 ft.

BLAS URIBE—ZAPATA COUNTY

O. W. Killam's No. 9 Bruni, 150 ft. SE line, 400 ft. NE line of Blk. 9, Blas Uribe tract, Borrego grant.
Location.

ESCOBAS—ZAPATA COUNTY

Trinity Drillers and J. C. McIntyre's No. 1 M. Trevino, 25 ft. W line, Blk. 13, Sur. 412, 150 ft. SE of Cerrito Blanco grant.
Drlg. 1,015 ft.; has sand and set csg.

United Prod. Co. et al's No. 1 Ramirez, 225 ft. from NE and SE lines of lease.
Drlg. 1,010 ft.

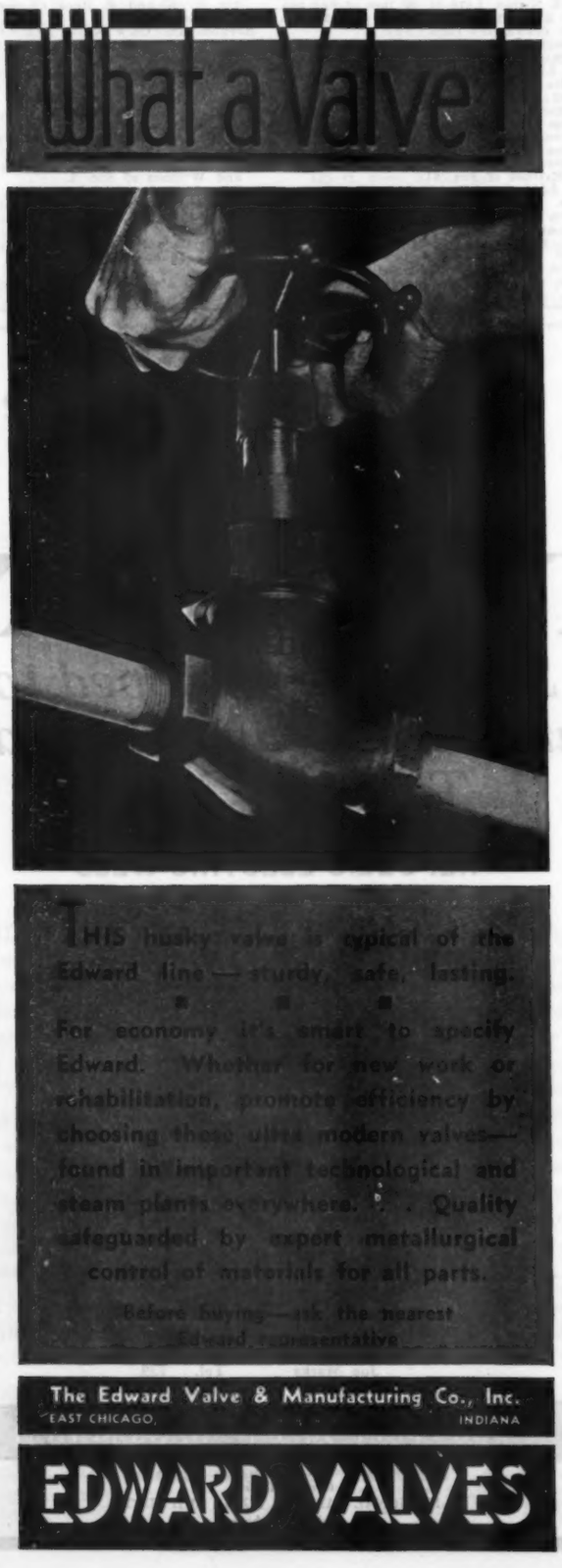
JENNINGS—ZAPATA COUNTY

Texas Co.'s No. 57 Whitehead, 1,115 ft. SE line, 18,992 ft. S line of Cerrito Blanco grant.
T.D. 1,220 ft.; I.P. 10 bbls. per day.

Texas Co.'s No. 58 Whitehead, 15,375 ft. SW line, 150 ft. SE line of Cerrito Blanco grant.
Rigging up.

RANDADO—ZAPATA AND JIM HOGG COUNTIES

Sulgrave Oil Co.'s No. 1-A Maryland Trust Co., 664 ft. from S line, 662 ft. from E line of Tract A, Blk. 29, Sur. 314.
Abd. 2,005 ft.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Among Gulf Coast Drilling Contractors

Ray Richmond, formerly superintendent for the Feltex Oil Corp., with headquarters in Houston, has acquired five drilling rigs and entered the drilling contracting business. Mr. Richmond, prior to his association with the Feltex Oil Corp., served as an engineer for the Texas Railroad Commission in the East Texas Field. He is best remembered as a production official for the Humble Oil & Refining Co., with which he was associated for many years. Mr. Richmond is at present in the Sam Fordyce Field, Hidalgo County, where it is possible he will ship one or more rigs on contract work.

C. & R. G. Drilling Co. has shut down temporarily on No. 1 Frank Truska, Brazoria County, for the Big Creek Oil Co., at 7,890 feet. The rig which carried the hole to this depth will be torn down, and a heavier rig substituted capable of carrying the hole down to the Frio formation, which is expected to be encountered at approximately the same depth as Harrison & Abercrombie's wildcat well at Old Ocean, which was bottomed at 8,651 feet.

J. S. Abercrombie, one of the pioneer Gulf Coast drilling contractors, now principally engaged in drilling wells for himself, and for Harrison & Abercrombie, has brought in the third deepest commercial producer in the Gulf Coast at Old Ocean, Brazoria County, finalled at 8,651 feet. The well is producing 60 gravity crude at the rate of 23 bbls. an hour on three-sixteenths-inch choke. The hole was drilled to this depth with a standard rotary drilling rig, and the only trouble encountered was a stuck drill stem resulting from lack of steam following a boiler failure. Drill pipe was promptly cut out with J. S. Abercrombie Co.'s outside cutting tool, and the hole finished without mishap. M. G. (Red) Early, superintendent for J. S. Abercrombie, was in charge of drilling operations, and John Bass was senior driller on the job.

Five deer and a large but uncounted total of "royal flushes" were stalked and bagged by a hunting party recently returned from the Guadalupe Mountains west of Carlsbad, N. Mex., comprised of R. Y. Smith of Smith & McDannald, Gus Arnold, land man for the Pure Oil Co., Arch Rowan of Rowan Drilling Co., C. L. McKinney of Smith & McDannald, and W. L. Caplin of Kilgore. All of the nimrods proclaimed the adventure a "natural," and hope to repeat frequently. It was unofficially reported that R. Y. Smith's aim at the deer was bad, but that his luck with the royal flushes established a new record.

George Echols has moved a rig on the East Ranch, Jim Hogg County, to drill a deep wildcat test for the Sun Oil Co.

Smith & McDannald are moving rigs onto two new locations in the Boscoe, La., Field to drill No. 1 Hebert and No. 3 Iseringhausen for the Superior Oil Producing Co. of Louisiana. The company also has rigs on No. 2 Larcade and No. 2 Arceneaux for the Superior in the same field. A fifth rig is rigging up to drill No. 2-B Wills in the Cayuga Field for Tide Water and Texas Seaboard oil companies, and a sixth rig is waiting on cement on No. 2 Garrett in the Louise Field for Pure Oil Co., oil string having been set.

J. & C. Drilling Co., Refugio, Tex., are drilling a well for Deering and others, 10 miles southeast of the Sam Fordyce Field. This wildcat has been carried to 5,564 feet, and is drilling ahead.

A. T. (Cap) McDannald, of Smith & McDannald, drilling contractors, works in an atmosphere of antiquity, surrounded on every side by archaeological, geological and armorial specimens assembled from all sections of the Mid-Continent and Southwest. Probably the outstanding feature of Mr. McDannald's collection is the number, types and kinds of Indian arrowheads and ax heads it contains. Excellent examples of pottery, small clay figures, stone pipes and other bits of handiwork of the ancient Aztec Indians of Mexico are much in evidence. "Believe-It-Or-Not" geological specimens, garnered from the drilling of hundreds of wells throughout the Mid-Continent, occupy a number of specimen cases. A recent acquisition is a skin covered saddle, found in a newly discovered cave in Central Texas, which is claimed to be equally as magnificent as Carlsbad Cavern. As Mr. McDannald's collection has grown, more and more friends have made contributions of oddities, many of them rare specimens. "Cap" allows that if the collection expands much more, another floor of the Esperson building will be required to accommodate it. Smith & McDannald, rated among the largest contractors in the Gulf Coast, formed their present organization in 1919, when R. Y. Smith and "Cap" McDannald combined forces. Company has dug wells in Texas, Louisiana, Oklahoma and New Mexico, and presently has six rigs running

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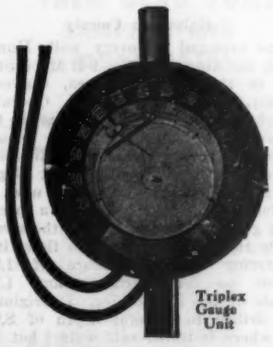

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Old Ocean Dome, Brazoria County, Wildcat Is Brought in Flowing 550 Barrels, 68 Gravity

By F. L. SINGLETON

Gulf Coast Bureau, The Oil and Gas Journal

HOUSTON, Tex., Nov. 12.—The Old Ocean geophysical prospect in western Brazoria County was proved for production the latter part of the week when Harrison & Abercrombies' No. 1 Bernard River Land & Development Co., wildcat in the Charles Breen Survey, was brought in flowing at the rate of 550 bbls. of 68 gravity distillate per day through a three-sixteenths inch choke with tubing pressure of 1,650 pounds. Production is from 21 feet of sand bottomed at 8,651 feet in the Frio. Seven-inch casing had been cemented at 8,606 feet.

The well started flowing after being washed four hours and in cleaning itself built up pressure from 500 pounds to 1,350 pounds in three hours through a one-quarter inch choke, and later increased its pressure to 1,650 pounds through the three-sixteenths inch choke, through which it was producing on latest report.

Acreage around the well is controlled by Harrison & Abercrombie, who have a block of approximately 4,000 acres. The well was drilled on the strength of geophysical indications. The area has been recognized as a prospect for a number of years, but the present producer is the first deep test which has been drilled.

Old Ocean is believed to be a deeply seated salt dome of the nonpiercement type, which includes such fields as Pledger, Van Vleck, Buckeye, Manvel, Thompson, Iowa, Roanoke, Bosco and a few others, all of which have been discovered in recent years. Exploration for and proving up of these deeply seated blanket sand fields has comprised one of the most important phases of the active development program which has been under way on the Gulf Coast. The main production of all these fields is in the same general horizon, the Marginulina or Frio sections of the Lower Oligocene. In nature of production the new field bears a particularly close resemblance to Pledger and Van Vleck, the former being around 10 miles to the northwest and the latter about the same distance to the west. The depth at which the sand was found, however, is somewhat lower, the discovery well being the third deepest well on the Gulf Coast, its depth being exceeded only by Superior Oil Producing Co.'s No. 1 Richard in the Boso Field and Shell Petroleum Corp.'s No. 1 Kratzer at Roanoke, the latter two wells being in coastal Louisiana. The sand is found around 6,800-6,900 feet at Pledger and around 7,000-7,100 feet at Van Vleck.

Galveston County

The expected discovery well, Humble Oil & Refining Co.'s No. 1-B Maco Stewart, in the Dickinson area, Galveston County, is still uncompleted. Operators have been washing and swabbing the well all week, but have been unable to make it flow. It is believed that the fine sand encountered from 8,003-24 feet clogged the screen and the operators now are pulling 5-inch tubing to run a perforating gun in attempt to clean the screen. While the test has failed to flow, it is registering a gas pressure of 1,950 pounds on 5-inch casing and 1,750 pounds on 9⅝-inch casing. It originally was drilled to a total depth of 8,070 feet where it tested salt water, but has been testing at a plugged depth of 8,024 feet. Location is in the John Sellers Survey, approximately a half mile west and a little north of the company's No. 1 Maco Stewart which blew out last August and was abandoned after it had caught fire. Approximately one-half mile due north of No. 1-B Maco Stewart, Pure Oil Co.'s No. 1 Shelor in the B.B.B.&C. Survey began making new hole after being plugged back to 7,300 feet on account of a crooked hole. Late in the week it was below 7,616 feet in soft shale, and it should reach the pay horizon during the week, as it is running considerably higher than No. 1-B Maco Stewart.

Liberty County

In the Hardin district, 11 miles north of Liberty, Liberty County, the wildcat test of Turnbull and Irwin's No. 1 Lynott and Buffum in the James Robeson Survey, continues to look encouraging and should reveal within the next few days whether it is to open a new field. It is coring in the Cockfield formation below 7,216 feet. The Cockfield was topped at 7,045 feet and the operators have been coring practically all the way, with several cores showing good saturation. The test is reported running considerably high on every formation and most every major and independent company is buying leases and royalty in the area.

Gulf Production Co. purchased 400 acres out of the B. E. Quinn 714-acre tract in the J. Young Survey for a consideration of $15 an acre cash, also the G. Cherry 35-acre tract in the J. Robeson Survey for $75 per acre cash. Tide Water Oil Co. purchased the east 90 acres of the Jeff Green and others' 100-acre tract in the H. B. Johnson league and the west 74 acres of the J. W. Green 174.2-acre tract in the A. B. Hardin one-half league. Consideration was $40 an acre cash. R. J. St. German purchased the north 25 acres of the W. McMurtry 53-acre tract in the H. B. Johnson league and the east 20-acre tract out of the W. McMurtry 33-acre tract in the A. B. Hardin one-half league, paying a total consideration of $2,000. Atlantic Royalty Co. purchased a one-fourth royalty interest under the J. C. Barfield 51.6-acre and 85-acre tracts in the J. Robeson Survey and the Barfield 36-acre tract in the H. B. Johnson league. Consideration was reported to have been $110 per acre base. Strake Petroleum Co. is reported to have paid $37.50 per acre cash and $37.50 per acre in oil for the W. T. Finley 198-acre tract in the A. B. Hardin one-half league.

Harris County

Another wildcat was added to the list of interesting wells on the Gulf Coast at the end of the week. It is C. B. Bunte, Inc.'s No. 1 Laura Lackner near the northwest city limits of Houston in the Henry Reinerman Survey which is preparing to make a drill stem test in sand cored from 7,687-91 feet, which carried a show of oil. It topped the Cockfield at 7,439 feet and is bottomed at 7,695 feet. American Liberty Oil Co.'s No. 1 J. J. Sweeney, another wildcat test in the northern part of the county, in Block 4, Section 17, W.C.R. R. Survey, is plugging to abandon at a total depth of 6,716 feet in brittle shale. With an elevation of 113 feet, it topped the Cockfield at 6,346 feet and on a drill stem test from 6,536-44 feet it tested considerable salt water.

Splendora Area

In the Splendora area, Montgomery County, Bryce McCandless and others are building derrick for No. 1 Texas Long Leaf Lumber Co., 330 feet from the north and east lines of the west one-half of Block No. 8 in the Walker County School Land Survey, approximately 1¼ miles west of Steen Drilling Co.'s No. 1 Texas Long Leaf Lumber Co., which was completed for a gas well several months ago. In the same county, Reynolds Drilling Co. is moving in material for a wildcat test on the Mrs. Clara B. Stewart lease. It is located 330 feet south and east of the most easterly inner corner of the Clara B. Stewart 595-acre tract in the John C. Corner Survey.

Chambers County

Humble Oil & Refining Co. made a wildcat location in Chambers County, to be drilled on the Middleton lease in the H.&T.C. Survey No. 58, Abstract No. 442. Location is 466 feet each way out of the southwest corner of the survey. In the southern part of the county, Sun Oil Co.'s No. 1 Hamilton, a wildcat in Section 128, T.&N.O. Survey, is drilling in sand below 2,305 feet. In the same county, a large block consisting of 11,770 acres belonging to the R. J. Barrow ranch, was leased by the Gulf Production Co.

Calhoun County

One mile north of Port Lavaca, Calhoun County, Steen Drilling Co.'s No. 1 F. Stanzel, a wildcat test in the A. E. Parza Survey, is shut down for orders after making a drill stem test from 6,100-50 feet which tested a show of gas with no working pressure, through a one-quarter inch choke on bottom and a three-eighths inch choke on top.

Waller County

In Waller County, Stanolind Oil & as Co. made location for a wildcat test to be located on the J. W. Throp lease. It is 466 feet from the south and east lines of the J. M. Bennett Survey, and is on a large block, which has been worked with geophysical instruments.

Mykawa Field

The Mykawa Field, Harris County, was extended a few hundred feet east by Danciger Oil & Refining Co.'s No. 1-A Minnetex when it was completed for an estimated 250 bbls. of oil daily flowing through a three-sixteenths inch choke, with tubing pressure 500 pounds. Seven-inch casing was cemented at 4,810 feet and it is bottomed at 4,869 feet. Location is in Lot No. 253, William Lovett Survey. Location has been made for No. 1 W. H. Williams which is 2,000 feet northeast of the above test, on the Williams 29-acre tract.

Kittrell Field

In the Kittrell Field, Houston-Walker County, Boone Brothers have abandoned their No. 1-A Texas Long Leaf Lumber Co., in the George Keilman Survey at a total depth of 2,526 feet in brown shale. It is about 3 miles from the discovery well in Walker County. Northwest of the discovery well in Houston County, Humble Oil & Refining Co.'s No. 2 Shaw is drilling in shale at 1,618 feet. The same company's No. 1 Texas Long Leaf Lumber Co. is drilling in shale below 3,735 feet. E. P. Kilgore's No. 1 Lamking, a scheduled 5,000-foot wildcat test in Walker County, is drilling below 3,345 feet in sandy shale. Location is in the J. J. Holcomb Survey.

Buckeye Field

The Buckeye Field, central Matagorda County, registered two abandonments during the week, when United North & South Development Co. quit its No. 1 Dr. Plotner (Unit 14) after it tested salt water at a total depth of 7,910 feet, and No. 1 Unit 58, which tested salt water at 7,955 feet.

Jackson Trend

On the "Jackson trend" centering around the common corners of Lavaca, DeWitt, Victoria and Jackson Counties, three wildcat tests are getting under way which will cause considerable interest to be centered on this area the next few weeks. The tests are on two geophysical "highs," one in southern Lavaca County where Humble Oil & Refining Co. and Magnolia Petroleum Co. have rigged up for a joint test. The two companies are reported to own approximately 27,500 acres in the area, with the Shell Petro-

Wildcat Operations on Gulf Coast

Week Ending November 10

RACCOON BEND—AUSTIN COUNTY

Humble O. & R. Co.'s No. 10 Paine.
Drlg. 1,627 ft.

Humble O. & R. Co.'s No. 1 Mueller.
Drlg. shale 2,028 ft.

Humble O. & R. Co.'s No. 1 Hill, Wm. C. White Sur.
Location.

Humble O. & R. Co.'s No. 6 Alberta Diemar, 535 ft. at R/A from NW line, 337 ft. at R/A from SW line, Wm. Harvey Sur.
Drlg. shale 4,632 ft.

DANBURY—BRAZORIA COUNTY

Shell Pet. Corp.'s No. 7 Blakely-Winston, 63 deg. 11 min. E, 5,540 ft. N, 26 deg. 49 min. W, 300 ft. from SW cor. of Blakely-Winston 560-acre tract, H.T.&B. Sur.
Drlg. sticky shale 1,932 ft.

Shell Pet. Corp.'s No. 3 Haury, 800 ft. SE of No. 2 in line with No. 2 and No. 1 Blakely-Winston, E.&T.B. Sur. No. 13.
Coring shale 6,569 ft.

DAMON MOUND—BRAZORIA COUNTY

Gulf Stream, Inc.'s No. 1 Cave Heirs, 160 ft. from N line and 60 ft. from E line of Lot C, Blk. 50, A. Darst Sur.
Location.

Maco's No. 1-D Wisdom, 25 ft. from S and W lines of Blk. D, Lot 5, A. Darst Sur.
Drlg. shale 2,000 ft.

Intercoastal Oil Co.'s No. 12 Wisdom, 90 ft. from N line and 35 ft. from W line of Lot A, Blk. 51, A. Darst Sur.
Drlg. shale 2,455 ft.

MANVEL—BRAZORIA COUNTY

Texas Co.'s No. 13-B Belcher, W of No. 10-B Belcher, H. N. Little Sur.
Rig up.

Texas Co.'s No. 9-A Belcher, 1,650 ft. S, 42 deg. W, and 330 ft. N, 48 deg. W of E cor. of lease, H. N. Little Sur.
Drlg. shale 5,357 ft.

Texas Co.'s No. 1 Thomas James, 247.5 ft. N and 330 ft. E of SW cor. of Lot 1, A. C.H.&B. Sur. 91, Abst. 402.
Drlg. shale 4,460 ft.

Texas Co.'s No. 11 Houston Oil Field Association, 441.8 ft. W and 247 ft. N of SE cor. of Lot 9, A.C.H.&B. Sur., 91, Abst. 402.
7-in. csg. 3,964 ft.; drlg. 3,987 ft.

Gulf Prod. Co.'s No. 4 Colby, 330 ft. out of most northerly NE cor. of 200-ac. tract, Thomas Sproggins Sur.
Drlg. sand and shale 4,535 ft.

Texas Co.'s No. 1-A Massey, 330 ft. out of NW cor. of 33-ac. tract in H. Stevens Sur.
Fishing 7,957 ft.

STRATTON RIDGE—BRAZORIA COUNTY

Amerada Pet. Corp.'s No. 1 Bowers, 2,405 ft. N line and 1,550 ft. from E line of Jared Groce Sur.
Drlg. shale 3,505 ft.

WEST COLUMBIA—BRAZORIA COUNTY

Texas Co.'s No. 84 Hogg, 2,483 ft. N, 50 ft. W from SE cor. of lease in M. Varner Sur.
Temporarily S.D. 5,342 ft.

BARBERS HILL—CHAMBERS COUNTY

McAlbert Oil Co.'s No. 7 J. F. Wilburn, 150 ft. W of No. 6 and C of H. Griffin Sur.
7⅝-in. csg. 4,590 ft.; T.D. 4,690 ft.

Mills Bennett Prod. Co.'s No. 2 Fisher, 150 ft. N of No. 1, Wm. Bloodgood Sur.
Abd. 5,466 ft.

Mills Bennett Prod. Co.'s No. 10 Wilburn,

(Continued on Page 170)

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leum Corp. owning a large block north of the test. The joint test is located on the C. S. Wilson lease.

Jackson County

Several miles due south in Jackson County, Humble Oil & Refining Co. is drilling below 3,540 feet in its No. 1 Lowrance in Survey No. 5. This test also is on a geophysical "high" and is to be drilled to 7,000 feet. The block takes in the 10,000-acre Lowrance ranch west of the Lavaca River and about 3 miles from the Lavaca County line, and an additional 5,000 acres east of the river.

Victoria County

Over the line in the northern part of Victoria County, several miles northeast of the above test, Texas Co. is coring in hard sand below 2,960 feet in its No. 1 E. P. Potthast in Section 11, T.&N.O. Survey. It is 1 mile south of the company's No. 1 Midgett which opened a new area several weeks ago when it was completed for a dry gas well at a total depth of 2,847 feet, after it had been plugged back from 5,790 feet and sidetracked at 1,734 feet. The company owns a block of approximately 7,500 acres in the area and is using the gas from the Midgett well as fuel for the Potthast test. In the Peter Teal League, Abstract 112, Devonian Oil Co. is drilling below 5,903 feet. It was reported to have had a gas showing at around this depth.

Refugio County

In the Tom O'Connor Field, Refugio County, Quintana Oil Co.'s No. 3-A O'Connor is drilling below 4,441 feet in shale. This is the third test to be drilled on the block and it is 396 feet from the southwest line and 1,107 feet from the southeast line of the J. M. Swisher Survey. The company's Nos. 1-A and 2-A O'Connor were completed for producers several months ago from two different sands. No. 1-A O'Connor was completed in sand from 5,569-75 feet and No. 2-A O'Connor opened a deeper sand a few weeks ago when it was completed from 5,759-5,808 feet. Six miles south and on a separate block the company has abandoned its No. 1-B O'Connor at 5,960 feet after it had tested salt water on a drill stem test. It was drilled originally to 7,046 feet and was plugged back and sidetracked at 5,954 feet and redrilled to 5,960 feet. Location is in the B.B.B.&C. Survey, 4 miles southeast of the town of Refugio.

Batson Dome

A new sand on the southwest flank of the Batson Dome, Hardin County, was proven productive by the completion of John Deering and others' No. 1 Hooks, which flowed 110 bbls. daily on a one-quarter inch choke, with tubing pressure 200 pounds and casing pressure 400 pounds. It is flowing from a total depth of 5,088 feet in shale, which is considerably deeper than the old production found on top of the dome. Location is in the Willis Donoho Survey.

Louisiana Gulf

New development started in the Louisiana Gulf Coast during the week, included three tests for the Iowa Field, Jefferson Davis Parish, and three new tests in the Bosco Field, Acadia and St. Landry Parishes.

In the Iowa Field, Shell Petroleum Corp. made locations for its Nos. 11 and 12 Heyd, both offsets, bringing the total operations of the field to seven. The company's No. 11 Heyd is 330 feet east and south of the NW cor. NE Section 13-9s-7w and offsets Magnolia Petroleum Co.'s No. 10 Wait, a drilling test. No. 12 Heyd offsets the company's No. 2 J. L. Johnson, a producer and is located 330 feet west and 330 feet south of the NE cor. NW Section 13-9s-7w. The other location was made by Magnolia Petroleum Co. for its No. 4 E. S. Willett, offsetting to the north Barnsdall Oil Co.'s A. O. Fontenot lease. Actual foot measurements were not reported.

Although foot measurements are not available at this time, Superior Oil Producing Co. made locations for three new tests in the Bosco Field, all within the proven limits. At the close of the week, the company had completed two tests for producers and was preparing to bring in another. The company's No. 3 Larcade in Section 26-8s-3e cemented 9⅝-inch casing at 7,846 feet and was completed for an initial production of 650 bbls. through a fourteen-sixty-fourths inch choke with tubing pressure 1,300 pounds and casing pressure 1,400 pounds. It is still cleaning itself and is expected to make a much better well after it has been cleaned thoroughly. No. 1 Trahan, Section 27, was completed for a producer but no gauge had been received from the field. It is producing from a total depth of 7,849 feet, with 9⅝-inch casing cemented at 7,839 feet. The operators were running tubing in No. 2 Iseringhauser in Section 35, and probably will have it completed within the next few hours. Seven-inch casing was cemented at 8,642 feet. Total depth is 8,664 feet.

In the northwest extension area of the East Hackberry Field, Cameron Parish, Union Sulphur Co. has abandoned its No. 9 Humble at a total depth of 5,661 feet in salt, which was topped at 5,998 feet. Location is in Section 12-12s-10w.

Roanoke Field

Humble Oil & Refining Co.'s No. 3 Devilbiss in the Roanoke Field, Jefferson Davis Parish, has been plugged back from 8,746 feet to 8,351 feet, possibly to test some upper sands. It is three-quarters of a mile southwest of the discovery well in Section 14-9s-4w. Another test which missed the pay found in the discovery well is drilling deeper in attempt to find a deeper producing horizon. It is Shell Petroleum Corp.'s No. 1 Jarnigan, an east offset to the discovery well, which is drilling below 8,973 feet in shale. On a test made at 8,746 feet, it flowed 34 bbls. of fluid per hour, of which 99 per cent was salt water.

Union Sulphur Co.'s No. 2 Barbee, the discovery well that opened a new field in the Gillis area in Calcasieu Parish a few weeks ago, is still showing an improvement in production, which makes the area more attractive for future development. When first completed the latter part of October it made from 175 to 200 bbls. of fluid per day of which 16 per cent was salt water, and at the present time it is producing around 425 bbls. of net oil per day, with the salt water content showing 25 per cent, and tubing pressure 850 pounds. It is bottomed at a total depth of 6,768 feet and is producing from sand topped at 6,760 feet. Three-quarters of a mile northeast in Section 12-9s-8w, the company's No. 1 State Land is drilling below 6,141 feet in sticky shale and barring accidents should reach the pay horizon found in No. 2 Barbee within the next two weeks.

The area received another active operation during the week when Fohs Oil Co. began building derrick for its No. 1 O. H. Castle, which has been a location for some time. It is 1 mile due south of the discovery well in Section 13-9s-8w on a block of approximately 1,900 acres.

In the same parish, but 5 miles northeast of the town of Starks, in Section 27-8s-12, Humble Oil & Refining Co.'s No. 1-B Industrial Lumber Co. is drilling in shale below 3,560 feet.

Conroe Trend

Along the "Conroe trend" in Allen and Beauregard Parishes, two wildcat tests located on geophysical prospects have reached interesting depths. In Allen Parish, Humble Oil & Refining Co.'s No. 1 Industrial Lumber Co. in Section 21-3s-5w on a 9,600-acre block is drilling in shale below 8,050 feet. Gulf Refining Co.'s No. 1 Lutcher Moore, Beauregard Parish, Section 25-6s-12e is drilling in hard shale below 7,063 feet.

In Jefferson Davis Parish, W. B. Conover has a block of approximately 7,500 acres centering in Section 5-8s-4w, and is expected to drill a test within the near future. The block has been worked by the Gulf Refining Co. with Pendulum and seismograph crews and it has purchased 1,900 acres scattered in Sections 4, 5, 6, 7, 8 and 9, Township 8s-4w.

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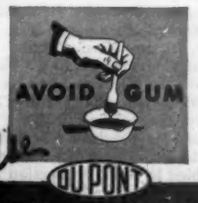

Eighteen Completions in Lower Eastern Fields; Southeast Ohio District Leading the List

By STAFF CORRESPONDENT

PITTSBURGH, Pa., Nov. 12.—In Amwell Township, Washington County, Southwest Pennsylvania, another fair gas well is being completed. Manufacturers Light & Heat Co. drilled in its test on the R. A. Rankin farm in the Nineveh Thirty-foot sand, the top of which was at 2,618 feet. At 2,646 feet gas was struck which was estimated at 1,500,000 feet a day and as the depth increased the gas volume also increased. The tools have reached 2,659 feet. This well offsets the test of the Carnegie Natural Gas Co. on the C. W. Farabee farm which was a gas well in the same formation and which had an initial gas volume of 5,000,000 feet a day with a rock pressure of 350 pounds. In this test, completed the early part of September, the top of the Thirty-foot sand was at 2,693 feet with the gas at 2,720 feet.

There were 18 completions in the lower eastern fields during the week, of which five were gas wells and 13 were producers, with an initial production of only 79 bbls. In addition there were six dry holes. Only three wells were completed in West Virginia, the majority being in Southeast Ohio.

SOUTHEAST OHIO

In Belmont County Peters and Patterson completed a test on the Julia Hudok farm, SE Section 26, Richland Township. It was completed in the Maxon sand and is a gas well showing for 200,000 feet a day initial.

In Coshocton County two tests proved dry. In the SW Section 3, Mill Creek Township, Byers, Johnson and others drilled a test on the Jacob H. Bechtol farm through the Berea sand to 925 feet. It was dry. In Newcastle Township, Preston Oil Co. drilled a second test on the William Ringwath farm through the Clinton sand to 3,249 feet. It was also dry in all formations.

In Chatham Township, Medina County, Curtis and Eaken completed No. 11 on the Harriet Broadsword farm, Tract 16, Lot 2, in the shallow Berea grit at 402 feet. In produced 2 bbls. the first day after shot.

In Muskingum County, Pure Oil Co. completed a second test on the Samuel L. Huffman farm, SW Section 4, Jackson Township. It is a Clinton sand producer at a depth of 3,068 feet and produced 10 bbls. the first day after shot.

In Noble County, G. M. Harper and others drilled a second test on the John Shafer farm, SE Section 32, Enoch Township, through the Macksburg 500-foot sand, depth 708 feet. It is a dry hole with the sand badly broken and a very light showing of oil.

In Perry County there was one gas well. In SW Section 9, Reading Township, Hopewell Fuel Gas Co. completed No. 4 on the Michael Emmert farm in the Clinton sand at a depth of 2,985 feet. It has a volume of 500,000 feet a day.

In Washington County there were several completions. In SW Section 12, Newport Township, Frances R. Meyer completed No. 9 on the John Bram farm in the Second Salt sand at a depth of 989 feet. It produced 2 bbls. the first day, natural, increased to 12 bbls. a day after shot. In the same quarter section this operator completed No. 17 on the Ada May Hall farm in the First Cow Run sand at a depth of 740 feet. It produced 2 bbls. the first day, natural, which was doubled by shot. In Section 33, Independence Township, near Archers Park, Herlan-Schramm and others completed No. 16 on the J. H. Ward farm in the third pay of the Salt sand at 1,200 feet. It produced 3 bbls. the first day after shot. In this township, in the northwest quarter of Section 2, Frank Hays and others drilled a test on the William Yost farm through the Big Injun sand to 1,590 feet. It was dry.

In SW Section 3, Wesley Township, Washington County, W. S. Harris drilled a test on the Zanesville Canal and Manufacturing Co. property through the Maxon sand to 997 feet. After shot it produced 2 bbls. the first day with about 10,000 feet of gas and the owner is undecided whether to put it to pumping. In the northern part of Lot 1,080, Palmer Township, Helen J. Burt completed No. 12 on the Burt farm in the Cow Run sand at a depth of 662 feet. It produced 1 bbl. the first day, natural, which was doubled by shot. In this township, and southwest quarter of Lot 1,078, M. A. Martin and others completed a test on the John Work farm in the Cow Run sand at 642 feet. It produced 1 bbl. the first day, natural, which improved only slightly when shot. In SW Section 29, Grandview Township, McVey Brothers and others drilled a test on the W. D. Webber farm through the Big Injun sand to 1,650 feet. It was dry and did not make a showing after shot.

SOUTHWEST PENNSYLVANIA

There were several completions in Southwest Pennsylvania, mostly the result of drilling deeper old gas wells. In Greene County, Guy Patterson completed No. 3 on the T. M. Ross farm in Richhill Township as a gas well. The top of the Gordon Stray sand was at 2,494 feet with about 95,000 feet of gas showing at 2,504 feet. The bottom of this formation was at 2,524 feet and the well was drilled to 2,670 feet. It was shot without increasing the volume. In Aleppo Township, Union Gasoline & Oil Corp. drilled deeper No. 1 on the Catherine Hughes farm, an old Injun gas well, to 3,251 feet. The top of the Fourth sand was at 3,167 feet with oil showing at 3,168 feet and bottom of the sand at 3,174 feet. The Fifth sand was between 3,238 and 3,240 feet with a showing of gas. It was completed as a producer and is making about 10 bbls. a day.

In Perry Township, Greene County, Carnegie Natural Gas Co. drilled deeper No. 1 on the Lucinda Wright farm, an old gas well, through the Bayard sand to 3,314 feet. It is rated at 7 bbls. a day. In Springhill Township, Myers, Hoskinson and others drilled deeper No. 1 on the J. R. Ayers farm in the Gordon Stray sand at a depth of 3,023 feet. It is pumping about 5 bbls. a day.

In Washington County, E. H. and J. B. Tague extended their Dunkard sand operations on the E. H. Grim farm in North Franklin Township. The Dunkard sand was at 864 feet and the well is showing about 10 bbls. a day.

In Beaver County, Beeler and McElroy drilled a test on the McKinney farm at Duff City and it proved a dry hole. In this county and Greene Township, Samuel Reed has started drilling on the Holmes farm. In the same township R. B. Abrams is drilling No. 3 on the Clara Cook and others lease. The hole is 400 feet. Frank Crook and others are drilling No. 8 on the Mrs. Sarah Dawson farm and have reached 300 feet.

In Allegheny County, O. Miller has a rig standing on the R. K. Hazlett farm in McCandless Township. In Shaler Township, J. S. Wally has reached 1,100 feet on the Peter Yester farm. On Lowries Run, C. B. Wachter is drilling a second test on the Joseph Pierce farm and has reached 1,600 feet.

In Amwell Township, Washington County, Carnegie Natural Gas Co. is spudding a second test on the M. Manon farm and has rigged up on the R. M. Carrons farm. In this township, Wise Oil & Gas Co. has a rig standing on the Jacob Snyder farm. F. K. Fawcett & Co. has a rig standing on the L. W. Phelan farm.

In East Findley Township, Washington County, Stewart, Plants and McCoy and others are drilling deeper an old Fifty-foot gas well on the Henry Allum farm to the Fourth sand. This well was formerly owned by Perry and others. Myers, Hoskinson and others are drilling at 910 feet on the M. C. Francis farm.

In Franklin Township, Carnegie Natural Gas Co. is drilling deeper No. 1 on the S. A. Dague farm at a depth of 2,878 feet and nearing the Fifth sand. In Cecil Township, George N. Glass and others are drilling on the Thomas Weaver farm and have reached 1,600 feet.

In Greene County, Carnegie Natural Gas Co. is preparing to drill No. 1 on the Thomas Brewer farm in Whitely Township from the Injun sand to the Bayard sand. In Dunkard Township, the test of the Vance leases on the James and Willis Vance farm has reached 2,184 feet. Top of the Injun sand was at 2,133 feet. In Greene Township, Equitable Gas Co. is drilling deeper No. 1 on the Margaret Kiger farm and has reached 2,450 feet. In Richhill Township, Wasmuth and Callahan are drilling at 1,925 feet on the Mary Bell Durbin farm and are also drilling the Mary Dague, same township, deeper. Freeland and others have reached 1,880 feet on the E. A. McCord farm.

In Muddy Creek Township, Butler County, the test of James H. Duff and John T. Galey on the Lehigh Portland Cement Co. lease, and which is scheduled for the Oriskany sand, has passed the 1,000-foot level.

WEST VIRGINIA

There were only three completions in West Virginia during the week, one a producer. In Gilmer County, south of the Godfrey L. Cabot, Inc., fair producer on the A. H. Blackshire farm in Center district the South Penn Oil Co. completed No. 3 on the Flora S. Bennett farm in the top pay of the Berea sand at 2,069 feet. It is showing for about 10 bbls. a day.

The Oriskany sand producer on the W. L. Burdette farm in Elk district, Kanawha County, about a quarter of a mile up Coopers Creek from the mouth at Elk River, is still flowing between 60 and 80 bbls. a day. Two tests are moving down to this formation in this vicinity. About 4,000 feet up Coopers Creek, S. B. Avis, trustee for Grosscup and others, are drilling at 1,700 feet on the Copen heirs farm. This location appears to be up structure, while down structure V. C. Smith and others have rigged up on the Island at the mouth of Coopers Creek known as the Matheney, Wertz and others lease. The outcome of these tests is the present interest focus in the state.

Gas Wells

In Lincoln County Hamlin Drilling Co. completed a test on the Victoria Adkins farm in Carroll district in the Berea sand at a depth of 2,251 feet. It is a small gas well gauging about 116,000 feet a day.

In Ritchie County, 1 mile south of Smithville on State Route 47 in Murphy district, W. H. Bickle completed a test on the Sherman Hardman farm in the Injun sand at 1,776 feet. It will make a light gas well.

Drilling in West Virginia

In Boone County, Pond Fork Oil & Gas Co. has reached 1,000 feet in No. 19 on the Cole and Crane lease in Washington district. In Crook district, Pure Oil Co. has reached 2,399 feet in the second test on the Pocatello Coal Co. tract. In Sherman district, this company is drilling at 900 feet on the Federal Coal Co. tract in No. 70 and has a rig standing for No. 71. Owens Illinois Glass Co. is down 1,380 feet on the Peytonia Coal Land Co. lease. Hope Natural Gas Co. has reached 3,451 feet in No. 54 on the Federal Coal Co. tract.

In Cabell County, R. H. Adkins and others are spudding on the F. F. Starcher farm in McComas district. In this district Carney Gas Co. is drilling at 1,100

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Railroad Spur Provides Convenient Delivery to Fitts

Anticipating the needs of operators developing the Fitts Pool, the Oklahoma City-Ada-Atoka Railway Co., member of the Midland Valley Railroad group, has installed an eight-car spur at Ahloso, about 6 miles southeast of Ada, Okla., and right at the intersection of State Highways 19 and 48. Oil field equipment is thus afforded convenient delivery to the field. J. W. Klein, freight traffic manager of the Midland Valley group of railway lines, said the same kind of service and facilities that was provided for shippers in the Burbank Field will be available at Fitts. He said provision would be made for tank car shipments of crude and casinghead gasoline.

Michigan May Reach 10,000,000 Bbls. in 1934; Ogemaw County Completes 2,000 Bbl. Well

By PAUL A. ELLIOTT
Staff Correspondent, Michigan Fields

MUSKEGON, Mich., Nov. 12.—Proration problems caused a minimum of concern in Michigan last week largely because of a decline of nearly 10 per cent in average daily production as restricted markets indicated a possible drop in the posted price. One purchaser of a comparatively small amount of crude in Central Michigan cut the price from $1.02, which has prevailed for more than a year since the beginning of Federal allowables, to 60 cents a barrel.

Pure Oil Pipe Line Co., principal purchaser, has made no move to cut the price although it has discontinued taking crude from the Ogemaw County Pool.

Michigan Producers Proration Committee announced there would be no change in the proration schedule for November, 50 bbls. minimum exemption and 5 per cent above the minimum. Porter Pool potentials have been reduced about 10 per cent under last month's total of 164,600 bbls. a day.

The Ogemaw County situation has become more serious as the result of an announcement the Simrall Pipe Line Co., second largest producer in Central Michigan, also has suspended buying any Ogemaw crude except that produced by the Theodore Oil Co., an affiliated concern.

Some early relief is seen in the construction of several small independent refineries now preparing to take crude from Porter Township wells and other producing areas in Central Michigan.

Despite the present critical crude situation, however, Michigan already has set a new production record with a total of 8,914,184 bbls. in 10 months, exceeding the record for the entire year of 1933 by nearly a million barrels and threatening to reach a total of 10,000,000 bbls. in 1934.

A total of 395 tests has been drilled during the 10 months ended October 31 resulting in 252 commercial oil wells with a combined open flow capacity of 106,000,000 feet a day and 105 dry holes or failures.

Ogemaw County

Two largest completions of the week, one a 2,000-bbl. well and the other a 14,400,000-foot gasser, were in Ogemaw and Mecosta County fields, respectively.

Youman's Dalton Oil Co. completed No. 1 E. Hustead, NW NW SE Section 36-22n-2e, West Branch Township, Ogemaw County, for an estimated initial of 2,000 bbls. in the upper Traverse. Traverse limestone was topped at 1,660 feet and the well was drilled only one foot in before acid treatment resulted in the heavy flow.

Field tankage was insufficient to make a complete test of the initial. The Hustead well is about a mile and a half southeast of the proved West Branch area and about the same distance northwest of C. A. Perry's No. 1 Wobig heirs in Section 6, Mills Township, recently completed as a commercial producer in the Dundee.

Muskegon Development Co.'s No. 1 Frank Estey, NW NW SW Section 28, same township, indicated initial production of 50 to 75 bbls. a day in the Dundee at a total depth of 2,696 feet. Theodore Oil Co.'s No. 3 Ogemaw Country Club, NW SW SE Section 20, also West Branch Township, topped the Dundee at 2,548 feet, drilled to a total of 2,727 feet and filled up with oil before acid treatment. It is expected to make a commercial producer. Weber Oil Co.'s No. 1 L. Doran, SE SW SE Section 27, same township, is shut down after drilling into the Traverse.

Melling Oil & Gas Co.'s No. 1 State of Michigan, SE SE NW Section 6-22n-3e, Mills Township, Ogemaw County, topped Dundee at 2,445 feet, drilled in, was acid treated and shut down. W. C. Mee's No. 1 Gibbs, SW SE SW Section 30, same township, drilled into water and probably will be plugged and abandoned.

Six tests were drilling, three in Ogemaw Township and three in West Branch, while six others were starting in West Branch Township.

Mecosta County

Completed in the record drilling time of seven days, Taggart Brothers, Inc.'s No. 1 Oscar Schuberg, C SW NW Section 4-14n-9w, Austin Township, Mecosta County, made 14,400,000 feet daily open flow. Michigan stray sand was topped at 1,322 feet and the well drilled to 1,327 feet. Taggart Brothers, Inc., expected to complete another well in the same section, No. 10 on the Fin Johnson lease, C SE NW Section 4, in which drillers made 217 feet of 16-inch hole in two and one-half hours with a rotary rig.

Gordon Oil Co.'s No. 1 Brisboy, C NW SE Section 8-13n-7w, Millbrook Township, Mecosta County, failed to strike gas in the Michigan sand and was drilling to the red rock.

One well was drilling in Hinton Township, one fishing in Green Township, one rigging in Martiny Township and five getting under way in Millbrook, Morton and Sheridan Townships.

Montcalm County

Four wells were active in Montcalm County including tests in Day, Home, Pierson and Richland Townships. Although none was completed, L. E. DuVall's No. 1 Mrs. Henry Eichnroch, NE NE NW Section 13, Pierson Township, was drilling below 1,100 feet, nearing the Michigan stray sand. Tope-Blunt-Voorhees' No. 1-A Neff Ranch, SW SE NW Section 22, Day Township, was delayed with a fishing job at about 3,200 feet on its way to the Dundee, while Daily Crude Oil Co.'s No. 4 H. P. Christensen, SE SW SE Section 3, Home Township, was drilling toward the upper Traverse at 2,500 feet. Rex Oil & Gas Co. of Muskegon has started No. 1 Church Keeler, SE NW Section 17, Richland Township.

Isabella County

A small gas well, one dry hole, one abandoned hole, two wells testing for shows and another nearing completion was the result in Isabella County. Chippewa Oil & Gas Co.'s No. 1 W. Cook, C NE SW Section 2-14n-6w, Broomfield Township, Isabella County, had an open flow of 200,000 feet a day in the Michigan stray sand. Bundy Hill Natural Oil & Gas Co.'s No. 1 W. Russell, NW NE NE Section 6, same township, was dry and abandoned in the Michigan sand.

Thompson Brothers, Inc., temporarily abandoned No. 1 Isabella County State Bank, SE NW SW Section 22-14n-5w, Deerfield Township, at 1,294 feet. Kenjos Oil Corp. continued testing in the Dundee in the No. 1 C. Calvin Chivington, SE SW NE Section 3-14n-3w, Chippewa Township, Isabella County. Michigan Gas & Oil Corp.'s No. 1 P. J. Marthey, Section 19-15n-3w, Denver Township, in the old Leaton Pool, had a light show of oil in the Monroe but continued drilling toward the Sylvania at 4,300 feet. Morris Oil & Gas Corp.'s No. 1 F. and C. Epple, SE NE SE, same section, was drilling at 3,400 feet, nearing the Dundee. One other test was shut down and two drilling in Broomfield. Two were drilling, two shut down and four starting in Denver Township.

Wittmer company's No. 1 Merrill D. Dunn, C E half NW Section 13, Isabella Township, was drilling at more than 3,000 feet, nearing the Dundee with two others active in the township. Two others in Isabella County, Youmans-Wyckoff Oil & Gas Co.'s No. 1 Roy Terry, C SW SE Section 33, Sherman Township, and Morris-Van Keuren Oil & Gas Syndicate's No. 3 Bowman estate, NW SE NE Section 27-16n-4w, Vernon Township, were drilling at more than 3,200 feet, nearing the Dundee.

Midland County

Although there were no completions in Midland County, an important development revealed unusually high formations in Goll, Graves and Mechling's No. 1 H. A. Crane test, a wildcat located NW NE Section 21-16n-2e, Mill Township. The indicator Red Rock in the lower Marshall was encountered several hundred feet higher than in other tests along the line of the new Beaverton-Gladwin discovery well.

Dr. Virgil R. D. Kirkham, geologist, is of the opinion this well lies on the same trend as the new Beaverton well extending through Grant, Beaverton, Tobacco and Billings Townships, of Gladwin County, and thence southeastward through Hope and Mills Townships, of Midland County, and into Garfield, Beaver, Kawkawlin and Monitor Townships of Bay County. Several other tests are being drilled along this trend.

Late reports on the Beaverton well credit it with a flow of about 60 bbls. a day. A show of gas encountered in the Berea in this well, M. F. Whitehill's No. 1 Omer Kintner, C S half NW NW Section 11-17n-2w, is believed by Doctor Kirkham to indicate the possibility of Berea production near the Saginaw Berea Field at the southeast end of the new trend paralleling the already developed high production trend through the Porter-Midland Field and adjoining pools.

Saginaw County

Smith Petroleum Co.'s No. 1 Edward E. Parlberg, NE SW SE Section 20-10n-6e, Birch Run Township, Saginaw County, was dry in the Berea topped at 1,525 feet and probably will be abandoned. Chapin Oil & Gas Co.'s No. 1 Sutliff, Section 16, Chapin Township, same county, was shut down at 2,507 feet after topping the Traverse at 2,410 feet. Two others were active in Saginaw County, one in Albee and the other in Tittabawassee Township.

Oakland County

T. F. Caldwell, Inc.'s No. 1 Beecher Mackey, NW SW SE Section 21, Lyon Township, Oakland County, was dry in the Dundee, total depth 1,325 feet and may deepen.

Western Michigan

A good show of gas was struck in the lower Traverse at 1,975 feet in the Lima Oil Corp.'s No. 1 W. R. Angell and Harry Spillman well, NE SW NE Section 22-10n-16w, Muskegon Township, Muskegon County. It may drill deeper. A. S. Cochran is expecting to make a small commercial upper Traverse producer of No. 3 Frank J. Durham, S SW Section 15-10n-16w. Both the Durham and Angell-Spillman wells are in the

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Bureau of Mines Report on Petroleum and Petroleum Products for September

According to reports received by the Bureau of Mines, Department of the Interior, the production of crude petroleum in the United States during September totaled 75,810,000 bbls. This represents a daily average of 2,527,000 bbls., a decline of 23,000 bbls. from the daily average in August and 84,000 bbls. below the average of a year ago.

Daily average production in most of the states declined in September, Texas being the only one that showed a material gain. The increase in Texas was almost as great as the combined declines in California and Oklahoma. The decrease in California was fairly well distributed throughout the State, but in Oklahoma a large part of the loss occurred in the Seminole district, bringing the daily average output of that area to below the 100,000-bbl. mark for the first time since October, 1931, when the field was practically closed down. Daily average production in East Texas increased from 486,000 bbls. in August to 524,000 bbls. in September; this accounted for practically all the gain in the State as the output of the other districts remained virtually unchanged.

Daily average crude runs declined 125,000 bbls. in September, or from an average of 2,571,000 bbls. in August to 2,446,000 bbls. in September. This decline was reflected in crude stocks, which were not reduced nearly as rapidly as in August but which declined 1,901,000 bbls. to a total of 348,937,000 bbls. on September 30, 1934.

The output of motor fuel registered a material decline in September as both crude runs and percentage yield declined. The daily average for September was 1,166,000 bbls., which is 64,000 bbls. below August and 60,000 bbls. below the average of a year ago. The daily average domestic demand for motor fuel was also 1,166,000 bbls., or 1 per cent above the average of a year ago. Exports of motor fuel decreased substantially from August and were lower than a year ago. Stocks of motor fuel continued to decline although the peak of withdrawals has definitely passed—the total on hand September 30 (52,542,000 bbls.) was 1,800,000 bbls. below stocks of August 31. Occurrences of particular interest concerning the minor products were gains in demand for kerosene and fuel oil.

According to the Bureau of Labor Statistics, the price index for petroleum products (1926 = 100) during September, 1934, was 51.3, compared with 51.6 in August and 49.6 in September, 1933.

The refinery data of this report were compiled from refineries with an aggregate daily recorded crude oil capacity of 3,608,000 bbls. These refineries operated during September at 68 per cent of their capacity, given above, which compared with a ratio of 72 per cent in August.

More Activity Being Shown in Fields of Central West as Winter Nears

By GEORGE A. WHITNEY
Staff Correspondent, Central West Fields

FINDLAY, Ohio, Nov. 12.—The Central West fields are showing more drilling activity than during the forepart of the year, as operators are anxious to get as many wells on production as possible before winter. Central Ohio and Kentucky are the most active.

In Hardin County, the Kenton Oil Co. is drilling a test on the Ella Dreuchel farm, Section 8, Pleasants Township. The Petro Producing Corp. is drilling No. 2 on the C. S. and Vesta Leymoyne farm, Section 35, Butler Township, Mercer County. In Wyandot County, there is one rig up and seven wells are under way.

CENTRAL OHIO

The Central Ohio Field had a very fair week with 21 completions, of which 3 were oil producers, with an initial of 82 bbls., 5 dry holes and 13 gas wells. In Ashland County, the Gold Crown Oil & Gas Co.'s No. 5 George Horn farm, Section 21, Lake Township, was dry in the Berea sand at 595 feet. Robinson and others are drilling No. 4 Phillip Doerr farm, Section 16, same township. Ohio Fuel Gas Co.'s No. 1 C. M. Wise farm, Section 1, Perry Township, same county, was a dry hole at 2,883 feet; and its No. 1 on the G. Heffelfinger farm, Section 33, Jackson Township, is a gas well. The company is drilling No. 1 John Mutchler farm, Section 3, Hanover Township, same county.

In Medina County, Ohio Fuel Gas Co. is drilling No. 1 on the F. F. Kovar farm, Lot 40, Hinckley Township. Its No. 1 David A. Pike farm, Lot 6, Homer Township, was dry at 2,858 feet.

In Holmes County, Ohio Fuel Gas Co. is drilling No. 2 Elnora Butler farm, Section 11, Richland Township. It has a location staked for No. 1 Alonzo Bucy farm, Section 10, same township, and is drilling No. 1 Clarence Conner farm, Section 32, Ripley Township, same county.

In Richland County, Ohio Fuel Gas Co.'s No. 1 W. T. Ramsey farm, Section 17, Worthington Township, is a gas well at 2,502 feet.

In Wayne County, Ohio Fuel Gas Co. is drilling No. 1 W. F. Berry farm, Section 12, Congress Township. In Summitt County, East Ohio Gas Co. is drilling No. 4 Everette Bexler farm, Section 17, Green Township.

In Lorain County, Ohio Fuel Gas Co. is drilling No. 1 A. S. Gibson farm, in Lot 80, Columbia Township. Same company is starting No. 1 Edward Robson farm, Lot 15, Carlisle Township, same county. J. W. Cushing is drilling No. 1 on the James and Anna Lewis farm, Section 15, Avon Township, same county.

In Fairfield County, City Natural Gas Works is drilling No. 2 M. E. Bowman farm, Section 34, Berne Township.

In Knox County, Upham Gas Co.'s No. 1 Charles M. Wander farm, Section 12, Jefferson Township, is a gas well at 2,964 feet. Lacknett and others' No. 1 Marvin Purdy farm, Section 18, Harrison Township, was dry at 784 feet. Reed Brothers are drilling No. 4 on the Blanch Reed farm, Section 14, Brown Township. In Butler Township, Ohio Fuel Gas Co. has a rig for No. 1 Catherine DeLong farm, Section 20, and the same company has a location for No. 1 on the H. H. Scott farm, also in Butler Township.

In Coshocton County, Preston Oil Co.'s No. 2 Cary D. Harris farm, Section 17, Perry Township, is a gas well at 3,131 feet. Pure Oil Co.'s No. 4 Ray Hays farm, Section 5, same township and county, produced an initial of 64 bbls. at a depth of 3,154 feet; and Murphy & Sons' No. 6 W. D. Mossholder farm, Section 15, is nearing completion. Johnson & Byers' No. 1 Jacob Bechtel farm, Section 3, Mill Creek Township, same county, was dry at 878 feet.

In Licking County, the Blue Rock Oil Co.'s No. 8, on the Walter Hoyt farm, Section 17, Perry Township, produced 7 bbls. at 685 feet. Preston Oil Co. is drilling No. 2 Frank Beckford farm, Section 18, Fallsburg Township, and has a location for No. 3 Wallace Davidson farm, Section 13. The Blue Rock Oil Co. is drilling No. 5 Rachael Freece farm, Section 14. Settles Oil Co. is drilling No. 4 Oren B. Evans farm, Section 2, Mary Ann Township, and the Everette Gas Co. is drilling No. 6 Feliz Claypool farm, Section 7, Hanover Township, same county.

In Muskingum County, the Pure Oil Co.'s No. 2 Sam Huffman farm, Section 4, Jackson Township, produced an initial of 12 bbls. at 3,056 feet. Same company is drilling No. 2 Oscar Mikesell farm, in the second quarter section and has rig up for No. 3 E. J. Hankins farm, same quarter. Hopewell Oil & Gas Co. has rig up for No. 1 on the Gertrude Vroom farm, in the third quarter section of the same township and county.

In Tuscarawas County, Frank Phillips and others are drilling No. 1 R. A. Stecker farm, Section 12, Oxford Township. Status Development Co. is drilling No. 1 on the R. E. and H. J. Stone farm, Section 4, Fairfield Township.

In Stark County, McClay Brothers' No. 1 J. and G. Lester farm, Section 6, Lawrence Township, is a gas well at a depth of 3,889 feet. In Plain Township, same county, Cunningham Natural Gas Co. made a location and has a rig on the ground for No. 1 on the Charles V. Wolfarth farm, Section 3, and Brendel Producing Co. has a location staked for No. 1 John C. C. Hinton farm, Section 9, same township. H. W. Hoover has rig on the Hoover farm, Section 21, same township and county.

In Belmont County, Barnsville Development Co.'s No. 2 Allen Bailey farm, Section 32, Goshen Township, is a gas well at a depth of 1,206 feet. A. J. West and others have a rig up for No. 1 on the Ensel O. Perkins farm, Section 17, Kirkwood Township.

In Delaware County, Chester Wise is drilling a test on the Herman D. Vance farm, Section 3, Orange Township.

In Guernsey County, Ohio Fuel Gas Co.'s No. 5 D. and M. Nesbitt farm, Section 21, Willis Township, is a gas well at 1,393 feet in depth. Same company is drilling No. 1 on the Homer A. Law farm, Section 22, same township, and No. 2 on the Clark V. Foraker farm, Section 20, same township. H. P. Muhlback & Son are drilling No. 1 on the Guernsey B. & L. Co.'s property, Section 11, same township. Same parties are drilling Nos. 6 and 8 on the Thomas Stewart farm, Section 21, same township, and also have a location made for No. 7 on the Stewart land, also in Section 21, Willis Township. Cleland Frame and others are drilling No. 7 on the James W. Tipton farm, Section 23, same township. Ferguson & McCullough are drilling No. 1 on the William Foraker farm, Section 22, same township and No. 2 Herbert Watson farm, Section 2, same township. Anderson Oil & Gas Co.'s No. 1 on the Albert J. Foraker farm. It is a gas well at 1,353 feet. In Cambridge Township, same county, Black Brothers are drilling No. 4 R. A. McBride farm, Lot 5.

In Gallia County, Ohio Oil Co. is drilling No. 1 S. R. Bing farm, Section 22, Addison Township.

In Meigs County, Rutland Township, Ohio Fuel Gas Co. has a location for No. 2 on the Meigs County Savings & Loan property, Section 2, and is rigging up to start operations. Rutland Gas Co. is drilling No. 1 Virginia Ailer farm, Section 8. Meigs Development Co. is drilling No. 1 Elizabeth Graham farm, in the same section. Hall Gas Co. is drilling No. 1 Edward Molden farm, Section 10, same township. Harrisonville Gas Co. is drilling No. 1 Jennie Jacks farm, Section 21, same township. In Sutton Township, same county, Caywood and others are drilling No. 4 William D. Roach farm, Section 30, same county. In Lebanon Township, same county, Ohio Fuel Gas Co. is drilling No. 1 Arthur Lovell farm, Section 25. Same company made locations for three wells in Lebanon Township, No. 1 J. J. Ours farm, Section 30; No. 1 on the James H. Powell farm, same section; and No. 1 on the Mollie T. Bookman farm, Section 36.

In Harrison County, Pittsburg Co. made a location for No. 1 on the L. W. Fisher farm, Section 4, Freeport Township.

INDIANA

The Indiana Field shows a revival in development work. In Adams County, Sheperd and others' No. 1 on the Glendenning farm, in the NE NW Section 34, Harrison Township, is reported showing for 15 bbls. initial.

In Gibson County, Gilbert Schoults' No. 1 on the Homer Davidson farm between Donations 107 and 118, in Washington Township, was a nice gas well at 1,237 feet. The Big Four Oil & Gas Co. is drilling No. 1 on the O. H. Redburn farm, in Donation 107. Same company's No. 2 on the Charles White farm, in the SE NW Section 18, is reported with an initial of 20 bbls. along with a good volume of gas at 1,287 feet.

In Dubois County, F. L. Damron's No. 1 on the J. Eck farm, in the NW NW Section 5, is a nice gas well at 50 feet, in the Mississippi lime. Same party hit a dry hole in No. 1 on the George F. Hautch farm, in the NE NE Section 6, same township and county.

In Hancock County, the Knightstown Natural Gas Co. struck a light gas well on the Wallace Webber farm, in Section 22, Jackson Township, and the same company found a dry hole on the Emma Ramsey farm, same section and county.

In Jay County, N. E. Master's No. 1 W. A. Frank farm, NW SW Section 19, Noble Township, is a nice gas well at 1,082 feet. In Penn Township, same county, Jones and others' No. 1 on the W. S. Clark farm, NW SE Section 22, is reported at 20 bbls. Same company found a small gas producer in No. 1 on the W. E. Paxon farm, SE SW Section 22, same township. In Wayne Township, N. E. Master's No. 1 on the Fannie North farm, SE SW Section 24, was a nice gas well at 1,100 feet. He is start-

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SAPULPA, OKLAHOMA, U.S.A.

Estimated 15,000 Barrel Well in Rainbow, Ark., District Is Producing 28.6 Gravity Crude

By J. R. CRUMPTON
Staff Correspondent, Louisiana-Arkansas

SHREVEPORT, La., Nov. 12.—The Rainbow Field, about 10 miles northeast of El Dorado, Union County, in the Arkansas district, is holding the center of interest in this division at this time. Short & Hayes' No. 1 Taylor, Section 10-17-14, developed on drill stem test from 3,360-66 feet an estimated 5,000 bbls. daily flow of 28.6 gravity oil. Three minutes after the testing tool was placed in the hole, it responded with a stream of oil that shot over the top of the derrick, and flowed consistently pure pipe line fluid with no trace of salt water until shut in.

The new production is about 160 feet below the discovery pay in this field and coming from the red bed series, the same productive formation as the shallower depth. The Short & Hayes test was originally started to drill to 5,000 feet when the oil show was encountered. The well is located on the defined structure in that area and has all the earmarks of being a good producer, some estimates are as high as 15,000 bbls. per day. However, due to the spotted and uncertain producers at the original pay level in this field, many operators are doubtful that the new strike will extend over a wide area, or if it does, that it will be spotted and fail to produce consistently. Six-inch casing has been set in the hole at 3,326 feet and the plug will be drilled and the well tested within the coming week.

Rush to El Dorado

The discovery has resulted in the city of El Dorado and the area surrounding it experiencing a boom of some proportions which may rival the series of booms following the discovery of the original field in that section. Several tests will be rigged up within a week on the edge of the 2,000 acres upon which the present test is located, and operators of wells now producing from the shallower depth are reported to be making plans to deepen. The future of this new pay zone depends upon the result of these tests, particularly those located on the original structure.

The Jovian Oil Co. has made location for its No. 1 Perdue, Section 3-17-14, on a good sized block about 1 mile north of the Short & Hayes well, and it is announced that drilling will start immediately. This location was staked before any showing developed in the present test, and is scheduled to drill to 5,000 feet. The oil fraternity in general in the North Louisiana and Arkansas districts would feel more optimistic about the new strike if it were several hundred feet deeper and from a sand body not identified with the red bed series.

None of the other wildcats in the South Arkansas district were on test during the past week, but a number in widely separated counties are making steady progress. In Arkansas County, Grand Prairie Realty Co.'s No. 1 Fischer, Section 6-6s-4w, is drilling at 450 feet, and a Columbia County test, Dudney & Woodward's No. 1 Pearce, Section 7-17-20, is drilling in shale at 2,160 feet. Three of the four Hempstead County tests are active. F. W. Martin & Co.'s No. 1 Lafferty, Section 17-14-24, pulled the derrick in and is rebuilding with the total depth of the hole at 3,760 feet. The Arkansas Drilling Co.'s No. 1 Jones, Section 11-14-24, is reaming to bottom at 2,808 feet, and E. L. Austin's No. 1 J. W. McWilliams, Section 19-13-23, is temporarily shut down for water at 2,000 feet. In Lafayette County, near the town of Stamps, Benedum & Trees' No. 2 Bodcaw Lumber Co., Section 19-16-23, is drilling in shale and lime at 4,196 feet. About 7 miles southwest of this test, A. H. Tarver is rigging up on his No. 1 Russell, Section 12-17-25, a third test in this immediate vicinity along the Balcones or what is known locally as the Humble fault.

NORTH LOUISIANA

This district reported 10 completions, consisting of four dry holes, five gas wells and one small oil well. Two of the dry holes were major disappointments from a wildcatting standpoint. In Bienville Parish, Benedum & Trees' No. 1 J. W. Sprawls, Section 17-15-6, was dry and abandoned at 5,005 feet. This test had an almost complete absence of red beds, and looked for awhile as if it might check high on the upper Trinity contact, but the log revealed that the latter horizon checked extremely low, even lower than the Blossom and Woodbine above, which was logged about 120 feet lower than other wells in that part of Bienville Parish. In the northern part of Bossier Parish, south of the Carterville Field, L. M. Moffitt and others' No. 1 W. H. Martin, Section 2-21-12, topped the Blossom at 2,640 feet, logged sand from 2,658-65 feet and was dry and abandoned at 2,929 feet. This is the third test, all dry holes in the Blossom horizon, to be drilled on a block of 17,000 acres and in which the Magnolia Petroleum Co. and Ohio Oil Co. has been interested in one or more of the tests. Another test in the northwestern part of Bossier Parish, about 7 miles west of the town of Plain Dealing which has been shut down since the early part of this year was finally abandoned as a dry hole. McKinney & Stewarts' No. 1 Nattin, Section 22-22-14, and located in a section where several wells have had good showings of oil from various depths, reported a good showing of oil from sand from 2,970-73 feet, but litigation stopped operations during the latter part of last year and the test was abandoned at the latter depth. In East Carroll Parish, in the northeastern part of the State, Holcomb & Thomason's No. 1 Milliken, Section 22-23-12e, topped the chalk at 3,028 feet and the red beds at 3,415 feet and was dry and abandoned in red beds at 3,505 feet.

The United Gas Public Service Co.'s No. 2 Skannell Unit, Section 14-17-12, Sligo gas district, Bossier Parish, was completed with an open flow gauge of 44,875,000 feet of gas from 4,284 feet. The rock pressure was 1,870 pounds, and production is coming from Oolitic lime of the Glen Rose in the upper Trinity. Three of the remaining gas wells were reported from Caddo Parish, two in the Blanchard shallow Nacatoch sand, both small gassers from the 940-foot level, and the other in an old proven area to the north. In Union Parish, Carbons Consolidated's No. 1 Lankford, Section 3-21-3e, gauged 1,500,000 feet of dry gas with 990 pounds rock pressure from 2,200 feet. The one small oil well was Ark-La-Tex Oil & Gas Co.'s No. 1 Simon, Section 15-20-15, Caddo Parish, pumping 100 bbls. of oil and 25 bbls. of salt water from 2,243 feet. The well is about 1 mile east of the old Caddo Field.

Two wells on the north and northwest flanks of the Converse Field, Sabine Parish, originally started to drill to sands below the chalk rock producing horizon in that area, are attracting some attention. Lawson & Leavell's No. 1 Whitney Corp., Section 5-9-13, about three-fourths of a mile northwest of Converse production, spudded in to drill to the lower Cretaceous around the 3,200-foot level, but encountered a good show in the Nacatoch. Eight-inch casing has been set at 1,514 feet and bailing is in progress from 1,605 feet. Two miles north of Converse, George Pace's No. 3 DeSoto Corp., Section 27-10-13, logged the base of Annona chalk at 2,006 feet and is arranging to test a sand encountered directly below this depth. Northeast of gas production in the Sligo Field, Bossier Parish, Producers Oil & Gas Co.'s No. 1 Werner, Section 7-17-11, is killing an estimated gas blowout of 5,000,000 feet to set liner and test from a total depth of 3,990 feet. An interesting wildcat in Natchitoches Parish, Benedum & Trees' No. 1 Carver estate, Section 6-8-7, topped the Arkadelphia at 3,386 feet, the Annona chalk at 3,555 feet and is drilling at 2,750 feet.

MISSISSIPPI

Only a few tests are active in this State at this writing. White & Jones' No. 1 Ballou, Section 17-24n-7w, Bolivar County, has spudded in and shut down at 20 feet. United Gas Public Service Co.'s No. 1 Greene County School Land, Section 16-1n-5w, Greene County, set 10-inch casing at 2,500 feet and is drilling at 2,850 feet. A Harrison County wildcat, Big Ridge Oil Co.'s No. 1 Hingin, Section 13-7s-10w, is drilling at 925 feet, and in Issequena County, the Pelican Oil & Gasoline Co.'s No. 1 Martin and Bender, Section 11-12n-8w, has spudded in and set 10-inch surface casing at 200 feet. P. J. McAlpine's two wells in Monroe County, one in the old Amory Field, and the second about 15 miles to the southeast in the Rye area, are both making headway, but neither has reached the pay zone for testing.

Production Estimate

The estimated daily average production of North Louisiana and Arkansas for the week ending November 10 was as follows:

NORTH LOUISIANA

	Bbls.
Bellevue	520
Caddo light	4,300
Caddo heavy	1,635
Converse	1,410
Cotton Valley	505
DeSoto and Red River	1,575
Elm Grove	365
Haynesville	3,730
Holly	160
Homer	2,680
Pleasant Hill	185
Sarepta-Carterville	610
Urania	3,285
Zwolle	2,670
Total	23,830

ARKANSAS

Champagnolle	1,100
El Dorado	2,350
Lisbon	370
Miller County	1,270
Nevada	890
Smackover light	2,310
Smackover heavy	18,970
Stephens	650
Urbana	2,300
Total	30,190

Wildcat Operations in Louisiana-Arkansas

(Rotary operations unless otherwise designated)

NORTH LOUISIANA

AVOYELLES PARISH

Bell Oil Co.'s No. 1 Woodley, 330 ft. S and W NE cor. NW Sec. 11-2n-5e.
Washing to bottom 1,700 ft.

BIENVILLE PARISH

Benedum & Trees' No. 1 J. W. Sprawls, 660 ft. S, 330 ft. W, NE cor. NW NE Sec. 17-15-6.
Dry and abd. 5,005 ft.

M. V. Duncan et al's No. 1 Hutton, 400 ft. S, 330 ft. E, NW cor. Sec. 4-18-7.
Rigging up.

T. L. James' No. 1 Harrison, SW cor. NW NW Sec. 2-16-6.
S.W. and abd. 3,005 ft.

Saline Drlg. Co.'s No. 1 Pardee, Sec. 27-14-6. Set 10-in. 142 ft.

BOSSIER PARISH

Goldman & Sklar's No. 4 Capita, 1,527 ft. S, 1,482 ft. E, NW cor. Sec. 25-16-12.
Set 6-in. 1,538 ft.

Howard & Baird's No. 1 Gold, 150 ft. S and E, NW cor. Sec. 36-20-13.
S.D. for water 1,126 ft.

W. A. Kirkland's No. 1 Jarrett & McKeller, 330 ft. N and W, SE cor. NW NW Sec. 3-21-13.
Set 10-in. 43 ft.

McKinney & Stewart's No. 1 Nattin, 470 ft. W, 620 ft. S, NE cor. Sec. 22-22-14.
Dry and abd. 2,973 ft.

L. M. Moffitt, tr.'s No. 1 W. H. Martin, 330 ft. S and E, NW cor. SW NW Sec. 2-21-12.
Dry and abd. 2,929 ft.

Premier Inv. Co.'s No. 14 Wyche, 660 ft. S, 150 ft. W, NE cor. NW NW Sec. 14-19-11.
Drlg. 300 ft.

Producers O. & G. Co.'s No. 1 Weiner, 660 ft. N and W, SE cor. Sec. 7-17-11.
Testing 3,990 ft.

Leonard Co.'s No. 1 Pearson, 250 ft. S and E. of C Sec. 22-21-14.
Drlg. 450 ft.

United Gas Pub. Ser. Co.'s No. 2 Skannell Unit, 990 ft. N, 660 ft. W, SE cor. Sec. 14-17-12.
Comp. 45,000,000 ft. of gas 4,284 ft.

United Gas Pub. Service Co.'s No. 1 Herold Unit, 50 ft. S and W, NE cor. SW SE Sec. 12-17-12.
Coring 4,262 ft.

CADDO PARISH

Ark.-La.-Tex. O. & G. Co.'s No. 1 Simon, 330 ft. N and E, SW cor. Sec. 15-20-15.
Comp.; 100 bbls.; 2,243 ft.

W. T. Bell et al's No. 1 Bostick, 1,820 ft. E. 660 ft. N, SW cor. Sec. 12-22-16.
S.D. for water, 2,540 ft.

S. Bendor's No. 1 Starr, 150 ft. N, 195 ft. E, SW cor. SW Sec. 36-20-16.
Comp.; 1,500,000 ft. of gas 2,258 ft.

Burkett O. & G. Co.'s No. 1 Lindholm, 400 ft. S and E, NW cor. NE SE Sec. 15-17-14.
S.D. 1,046 ft., repairing rig.

Capitol O. & G. Co.'s No. 1 Noel Est., 300 ft. S and E, NW cor. NE Sec. 13-20-16.
Abd. 450 ft.

O. L. Hickman's No. 1 fee, 1,046 ft. S, 1,700 ft. E. NW cor. Sec. 36-17-15.
Drlg. 1,880 ft.

A. D. King, tr.'s No. 1 Roach, 641 ft. E, 375 ft. N, SW cor. SE Sec. 4-14-16.
S.D. 2,128 ft.

Shreveport Oil Corp.'s No. 3-B Muslow, 742 ft. E, 710 ft. S, NW cor. Sec. 4-20-15.
Drlg. 250 ft.

Leonard Co.'s No. 4 S. P. Harrell, 220 ft. N and W, SE cor. NW SW Sec. 2-21-16
Rigging up.

CALDWELL PARISH

Terrell & Price's No. 1 La. Central Lbr. Co., 300 ft. N, 200 ft. W, SE cor. NW NE Sec. 18-11-3e.
T.A. 3,485 ft.

CATAHOULA PARISH

T. R. Hincy's No. 1 La. Central Lbr. Co., Sec. 32-9-4e.
Drlg. 1,230 ft.

DE SOTO PARISH

L. H. Alderson's No. 1 Peek, SE cor. NW NE Sec. 25-11-13.
Drlg. 300 ft.

Bayou Pierre Oil Co.'s No. 1 B. Y. Wemple, C SE NE SW Sec. 14-12-11.
Bailing to test 2,731 ft.

Century O. & Drlg. Co.'s No. 1 Morton, 300 ft. N and E SW cor. SE NE Sec. 27-11-14.
S.D. 1,760 ft.

Jack Clarke's No. 1 Moore, 330 ft. S and W NE cor. NW Sec. 1-13-15.
S.D. 1,675 ft.

W. T. Coleman's No. 1 Rambin Est., 200 ft. S and E, NW cor. SW SE Sec. 13-12-12.
Drlg. 445 ft.

Dempsey & Manziel's No. 1 Thigpen, 375 ft. S, 330 ft. W, NE cor. SW NE Sec. 33-13-13.
Drlg. plug to treat with acid, 1,730 ft.

DeSoto Pet. Co.'s No. 1 B. Y. Wemple, C S½ SE NE SW Sec. 14-12-11.
Drlg. 2,175 ft.

E. L. Foster's No. 1 Youngblood, Sec. 3-11-14.
R.U. to deepen 1,502 ft.

Hester et al's No. 1 Alston, 330 ft. S and W of center of Sec. 11-11-16.
Tested dry; W.O. 2,145 ft.

(Continued on Page 172)

Haury-Burrton Field, Eastern Reno County, Shows More Wells of Big Production From Hunton

By JAMES McINTYRE

The Haury-Burrton Field in eastern Reno County and all of Russell County are in the limelight in Kansas, overshadowing in interests all other areas in the State. The western side of the State continues to interest lease buyers and there appears to be lively dealing in several western counties. The Haury-Burrton Field yields big wells from Hunton lime.

Smith & Ash's No. 1 Wessler, NW cor. Section 19-17-9w, Ellsworth County, swabbed 82 bbls. per hour on Saturday, but the producing formation was not learned.

D. R. Lauck's promising looking test south of Wichita, Sedgwick County, SE SE SW Section 24-29-1w, passed through an oil showing in chat at 3,342-68 feet only to encounter a hole full of water at 3,397-3,415 feet and was drilling at 3,492 feet.

Barnsdall Oil Co. and others' No. 2 Baughman, C SE NE NE Section 34-23-4w, Burrton Pool, Reno County, which flowed 3,042 bbls. in 24 hours from Hunton lime at 3,579-85½ feet, was given an acid treatment and produced 250 bbls. per hour or at the rate of 6,000 bbls. per day.

Estimated Production

Estimated daily average production of Kansas for the week ending November 10 and for the preceding week follows:

	Barrels	
	Nov. 10	Nov. 3
Hollow	5,700	5,250
Ritz-Canton	10,900	10,400
Voshell	5,275	5,450
Johnson	1,370	1,863
Sedgwick County	7,450	7,600
Nikkell	5,600	5,675
Ellsworth County	2,320	1,877
Barton County	2,090	1,205
Rice County	13,350	13,278
Reno County	7,700	8,330
Ellis County	543	225
Kingman County	1,407	1,552
Stafford County	1,495	2,275
Russell County	6,250	6,600
Greenwood County	11,350	11,350
Butler County	19,000	19,000
Other pools	17,600	18,145
Total	120,600	119,975

Sumner County

Ben Gralapp has cellar dug for No. 1 Lamb, NW NW SE Section 10-35-2, Sumner County.

Cowley and Elk Counties

Pryor & Lockhart completed No. 2 Headley, NE SW SW Section 20-31-6, Cowley County. It is a 25-bbl. completion at 2,905-29 feet.

Superior Oil Co. has spudded No. 3 Rarick, NE SE SE Section 22-31-10, Elk County, and Theta Oil Co. has made a location for No. 2 Walker, NE cor. Section 27-31-10.

Kingman County

Skelly Oil Co. was building rig for No. 5 N. Miles, 990 feet north and 440 feet west of SE cor. Section 19-27-10w.

Sedgwick County

Dickey Oil Co.'s No. 1 Law, NE NW NE Section 20-28-1e, Sedgwick County, flowed 341 bbls. in 24 hours, with a showing of water, after having been acidized at 3,081-3,119 feet in Mississippi lime. It was a potential test.

Sovereign Oil Co. completed No. 1 Scherger, 250 feet from south line and 1,110 feet from west line of NW Section 6-26-1e. It pumped a potential of 188 bbls. of oil and 15 bbls. of water from pay at 2,580-2,676 feet which had been twice acidized.

Shell Petroleum Corp.'s No. 9 Fisher, 990 feet south and 1,344 feet west of NE cor. Section 15-26-2, swabbed 450 bbls. of oil and 225 bbls. of water from Viola lime at 3,199-3,201 feet. It had not been acidized.

Butler County

Bill Rex and others' No. 1 DeMoss, NE NE NW Section 8-28-7, Butler County, was completed. It pumped 35 bbls. in 24 hours from pay at 2,665-95 feet, which had been shot with 80 quarts.

Al Becker completed No. 1-A Beedles, a twin, SW SE NE Section 8-27-6, a 50-bbl. pumper at 2,757-72 feet, which had been acidized.

Sheldon and others had machine in for No. 1 Willson, SE NW SW Section 12-25-3.

Greenwood County

Kite and others' No. 1 Jamieson, SW SE NE Section 30-26-13, Greenwood County, was being rigged up.

T. K. Simmons and others' No. 8 Clopton, SW NE NW Section 18-22-11, was dry and abandoned at 2,210 feet, 12 feet in Mississippi lime.

Reno County

Olson Oil Co. and Shell Petroleum Corp.'s No. 1 Downie, SE SW NE Section 14-23-4w, flowed 1,376 bbls. in 24 hours from Hunton lime at 3,589-3,604 feet. It had not been acidized.

Olson Oil Co. and Shell Petroleum Co.'s No. 3 Goering, SW cor. Section 26-23-4w, was completed. It was acidized at 3,570-88 feet, and flowed 5,460 bbls. in 24 hours.

Barnsdall Oil Co. had rig up for No. 4 Sabin, NW SW SE Section 11-23-4w, and Skelly Oil Co. had rig up for No. 3 Sabin, NE SE SW Section 11-23-4w.

Derby Oil Co.'s No. 1 Billau, SW SE SW Section 5-22-1w, had Hunton lime at 3,306-21 feet. It pumped 60 bbls. of oil and 146 bbls. of water in 24 hours. It had not been acidized.

Shell Petroleum Corp.'s No. 5 Koehn, SE NW NE Section 16-21-3w, was shot with 30 quarts and then with 50 quarts in Wilcox sand at 3,390-3,410 feet and swabbed 125 bbls. in 17 hours.

Rice County

Tom Palmer and Atlantic Oil Producing Co.'s No. 2 Specht, SW cor. Section 16-20-10w, Rice County, was abandoned at 3,365 feet. The hole filled with water from Siliceous lime topped at 3,307 feet, water at 3,355 feet.

Slick, Pryor & Lockhart's No. 6 Shurr, SW NW SW Section 21-20-10w, had Conglomerate at 3,260-95 feet, total depth. The hole filled with oil in 12 hours. It had not been tested.

Vickers Petroleum Co.'s No. 4 Binger, SW NW SE Section 21-20-10w, was completed. It produced 524 bbls. in 24 hours from Siliceous lime at 3,335-40 feet.

Marathon Oil Co.'s No. 4 Proffitt, NW SW NW Section 5-20-9w, was completed. It made a potential production of 933 bbls. in 24 hours from Siliceous lime at 3,276-81 feet. It had not been acidized.

Sinclair Prairie Oil Co.'s No. 1 Volkland, NE SE SE Section 20-19-9w, pumped a potential production of 484 bbls. in 24 hours from Siliceous lime at 3,204-25 feet, which had been acidized. It was completed. Same company made a location for No. 2 Volkland, SW SE SE Section 20-19-9w.

C. B. Davis and Gypsy Oil Co.'s No. 3 Christopher, SE NW SE Section 31-19-9w, was abandoned. It was a hole full of water at 3,301-07 feet. Same operators made a location for No. 1 Dueser, C W half NE SW Section 31-19-9w.

McPherson County

Roth & Faurot completed No. 2 Almen, SE SW SE Section 13-19-3w, McPherson County. It made a potential production of 253 bbls. of oil with about 75 bbls. of water, from Chat at 2,970-3,031 feet.

Shell Petroleum Corp. was rigging up No. 2 Lawrence, SW NE NW Section 35-19-3w, to deepen it from 3,052 feet and same company was building rig for No. 8 Griffin-A, 1,314 feet north and 330 feet west of C Section 14-19-2w.

Wolf Creek Oil Co. completed No. 5 Krehbeil, C SE NW Section 25-19-2w. It made a potential production of 198 bbls. in 24 hours from Chat at 2,926-75 feet.

Tom Palmer had cellar dug for No. 1 Gustafson, NE NE NW Section 30-18-2w.

Russell County

Lario Oil & Gas Co. and others made a location for No. 1 Nuss, NW SW SW Section 11-16-14w, a wildcat, in Russell County.

Empire Oil & Refining Co. completed No. 1 J. Krug, SE SW SW Section 13-15-14w, in Siliceous lime at 3,353-58 feet. It had been acidized and started at 465 bbls. per day.

Central Petroleum Co. had rig on the ground for No. 2 Dortland B, SE SW NW Section 4-14-15w.

H. H. Blair's No. 1 Fink, SW NW SE Section 16-14-14w, set 8-inch pipe at 3,070 and drilled to 3,159 feet. It pumped 290 bbls. in a 24-hour test and was then acidized for the second time.

Beardmore, Palmer and Gypsy Oil Co. had rig on the ground for No. 5 Weiland, SE NE SE Section 36-12-16w.

Central Oil Co. and T. C. Johnson's No. 3-A Sutton, SE NE SW Section 5-12-15w, an old well deepened from 2,284 feet to 2,690 feet, showed a 15-bbl. production at 2,684-90 feet. Was acidized but showed no increase. It was then drilled to Oswald lime at 2,753 feet and at 1 foot in, the hole filled 600 feet with oil in four hours.

Stanolind Oil & Gas Co. completed No. 24 Austin, NE SE NW Section 8-12-15w. Deepened from 3,016 feet, it found Gorham sand at 3,211 feet and pay at 3,220-35 feet. It pumped 48 bbls. of oil and 390 bbls. of water in 24 hours.

Wildcat Operations in Kansas

Week Ending November 10

(Descriptions are East unless marked otherwise)

BARBER COUNTY

Lario O. & G. Co.'s No. 1 Whelan, C NW Sec. 22-31-11w.
Chat 4,355-4,435 ft.; P.B. to 4,380 ft.; pumped 25 bbls. fluid per hr.; 10 to 20% wtr.

BARTON COUNTY

Murphin and Downing's No. 1 Lanterman, NW SE Sec. 18-19-11w.
H.F.W. 2,075-80 ft.; U.R. 8-in. csg.

C. L. Price et al's No. 1 Ehrlich, NW SE Sec. 10-16-13w.
T.D. 360 ft.; fishing.

Treleaven & Brimm et al's No. 1 Haas, SW cor. Sec. 30-18-15w.
Set 15-in. csg. 335 ft.; drlg. 415 ft.

Walter Shearen et al's No. 1 Kempler, SE NE NE Sec. 21-18-11w.
S.D. 300 ft.

BUTLER COUNTY

Seibel, Great Basin Oil Co. et al's No. 1-A McKinley, NE SE Sec. 19-29-4.
K.C. lime 1,888-1,915 ft.; will acidize.

Bill Rex et al's No. 1 DeMoss, NE NW Sec. 8-28-7.
Sand 2,665-95 ft.; shot with 80 qts.; pumped 35 bbls. in 24 hrs.; comp.

F. H. Unruh et al's No. 1-A Joseph, SE SW NW Sec. 18-25-4e.
Rig.

CLAY COUNTY

Seidel Bros.' No. 1 Youkers, C S½ SE NW Sec. 21-9-4.
S.D. 1,353 ft.

Severs et al's No. 1 Meyers, NE NW NW Sec. 4-10-4.
Mississippi lime 1,775 ft.; T.D. 1,834 ft.

COWLEY COUNTY

Ben Gralapp's No. 1 Kukuk, SW SW NW Sec. 4-33-4.
Spudded.

Otstot et al's No. 1 Eckhardt, SE NW Sec. 15-35-6.
Spudded and S.D.

DICKINSON COUNTY

Dutch Oil Co.'s No. 1 Phillips, C NE NW Sec. 15-15-1e.
Set 8-in. csg. 2,500 ft.; S.D.

ELK COUNTY

Lassen's No. 1 Ferguson, SE SE SW Sec. 21-30-8.
10-in. pipe at 890 ft.; drlg. 940 ft.

ELLSWORTH COUNTY

Ainsworth Bros.' No. 1 Charvat, NE NW NE Sec. 33-15-10w.
Set 10-in. pipe 1,850 ft.; drlg. 2,307 ft.

Eldorado Ref. Co.'s No. 1 Stratman, SW SE SE Sec. 32-14-11w.
Drlg. 3,152 ft.

Lario Oil & Gas Co.'s No. 1 Harbalek, SW NW Sec. 7-16-10w.
Set 8-in. csg. 2,404 ft.; drlg. 2,975 ft.

GREENWOOD COUNTY

Greeley et al's No. 1 Satler, SW SE SW Sec. 28-25-12.
S.D. 885 ft.

Texas Co.'s No. 1 Edwards, NE NW NE Sec. 32-24-12.
Spudding.

HARVEY COUNTY

O. J. Connell et al's No. 1 Roth, SW cor. Sec. 16-22-2w.
Location.

Imo O. & G. Co. et al's No. 1 Sperling, SE NE NE Sec. 23-22-2.
Set 10-in. csg. 1,390 ft.; drlg. 1,780 ft.

Wensel et al's No. 1 Schrag, NW SE Sec. 24-22-3w.
T.D. 587 ft.; S.D. for csg.

McPHERSON COUNTY

C. W. Lamer et al's No. 1 Rolander, NE NE NW Sec. 8-18-2w.
T.D. 2,260 ft.; U.R. 8-in. csg.

Roth-Farout et al's No. 1 Bestwater, SE SW SE Sec. 23-20-1w.
H.F.W. 2,102 ft.; drlg. 2,200 ft.

NESS COUNTY

Texas Co. and Gypsy Oil Co.'s No. 1 Goodman, C SW SW Sec. 21-19-22w.
Rotary rig.

OSAGE COUNTY

Jim Edwards' No. 1 Detrich, C NW SE Sec. 21-14-15.
Spudded and S.D.

OSBORNE COUNTY

Carmen & Hershey's No. 1 Fritz, C NE NE Sec. 9-10-14w.
Set 10-in. csg. 2,420 ft.; S.D. 2,875 ft.

RENO COUNTY

Foraker et al's No. 1 Hiett, SE SW NE Sec. 34-24-4w.
Drlg. 330 ft.

McBride et al's No. 1 Popp, SW SW NE Sec. 32-24-4w.
Wtr. at 3,438-43 ft.; drlg. 3,499 ft.

Privett Drlg. Co.'s No. 1 Crotts, NE NW NE Sec. 27-26-10w.
Set 10-in. csg. 2,146 ft.; drlg. 2,365 ft.

RICE COUNTY

Foraker, Nickerson et al's No. 1 Lyon, SE NW Sec. 27-20-8w.
S.D. 1,060 ft.

Lario O. & G. Co. and Reserve Pet. Co.'s No. 1 Shepherd, SW SW NW Sec. 18-22-5w.
Location.

Lario O. & G. Co. et al's No. 1 Schrag, NW SE SW Sec. 22-19-4w.
Spudded.

Marathon Oil Co.'s No. 1 Kline, SW SE Sec. 19-14-24w.
Set 10-in. 3,408 ft.; drlg. 3,755 ft.

Stark & Weil's No. 1 Smith, NW cor. Sec. 30-19-8w.
Location.

Twin Drlg. Co. et al's No. 1 Rolfs, SW NW SW Sec. 13-17-9w.
Drlg. 2,500 ft.

Langston et al's No. 1 Markle, NE SW Sec. 1-20-9w.
Show of oil 2,896-2,906 ft.; S.D.

Yingling et al's No. 1 Maupin, NW SW SW Sec. 1-18-8w.
T.D. 2,740 ft.; fishing.

ROOKS COUNTY

Stearns & Streeter's No. 1 Meyers, NE NW NW Sec. 34-9-16w.
Spudded.

(Continued on Page 170)

Canadian Oil Production Shows Large Increase During First Eight Months

By VICTOR LAURISTON
Staff Correspondent, Canadian Fields

CHATHAM, Ontario, Nov. 10.—Officials of the Department of Trade and Commerce at Ottawa show that crude petroleum production from all Canadian fields in August totaled 114,778 bbls., compared with 120,772 bbls. in July and 101,533 bbls. in August, 1933. For the first eight months of 1934 the total Canadian production is 952,171 bbls., a 29.5 per cent increase over the production of 735,167 bbls. for the corresponding period last year.

Mar Jon Section

In Section 28-18-2w5, South Turner Valley, Spooner Oils' No. 5 Anaconda, LSD 1, after getting the lime at 5,514 feet is below 5,565 feet and getting some gas production. Carleton Royalties' No. 1 Morris and Goodfellow, LSD 3, same section, got an unexpected show of crude oil at 2,760 feet and is deepening below 3,100 feet. Pacalta Oils' No. 1, LSD 7, is at 5,120 feet and waiting for rotary parts. British Dominion Oil & Development Corp.'s No. 4, LSD 6, has a show of oil at 3,825 feet, apparently near the top of the Blairmore formation. A previous show was met at 3,380 feet. Publix Oil & Gas Co.'s No. 1, LSD 8, is sidetracking around 4,500 feet. Director Royalties' No. 1, LSD 16, is around 4,600 feet.

South End Tests

In the new southerly extension of the field, Myers & Wright's No. 1 Pacalta, LSD 14, Section 21-18-2w5, is resuming from 2,260 feet after cementing against caving. Union Freehold Oil Corp.'s No. 1, LSD 8, same section, is resuming from 4,680 feet after changing to rotary tools. Highwood Royalties' No. 1 Oliver, LSD 3, same section, is working on casing at 2,460 feet.

On the east side of the structure, Merland Oil Co.'s No. 2, LSD 13, Section 27-18-2w5, is below 600 feet. Nolan-Hungerford Royalties' No. 1 Rand, LSD 5, Section 34-18-2w5, is standing at about 2,705 feet.

Central Turner Valley

In the Central Turner Valley Field, New McDougall-Segur Oil Co.'s No. 7, Section 12-20-3w5, is underreaming at 3,665 feet with a lot of oil in the hole.

Aldersyde Structure

On the Aldersyde structure, east of the Turner Valley Field, Ranchmen's Gas & Oil Co.'s No. 1, has run 5-inch casing to bottom at 6,265 feet. It is the longest string of casing in an oil well in Canada. The 5-inch hangs free all the way, and is inside the 6-inch for a depth of 3,800 feet. Water and mud, which have been holding back heavy gas pressure, are being bailed before drilling into the sand.

A Colorado-Alberta group, financed largely by Denver capital, has tentatively located a second test on this structure, to spud this fall or early next year. Location is west of Cayley, across High River and some miles south of Ranchmen's No. 1. Since oil shows were encountered in Ranchmen's No. 1 earlier in the year there has been extensive filing on the Aldersyde structure, leasing having been largely in Range 29, extending from Township 17n into Township 20. The Colorado Syndicate's No. 1 will likely be drilled in the western portion of Township 17. Considerable geological and seismographical work has been done in the area and the Canadian Western Natural Gas, Light, Heat & Power Co. and Imperial Oil, Ltd., are both understood to be interested. The Aldersyde Dome lies 17 miles east of the Turner Valley structure, and the idea originally held by geologists was that it followed the same northwest-southeast trend; but the recent leasing has been almost directly north and south. North of Township 20 and a little north and east of Ranchmen's No. 1 is an unfinished test of Twin Dome Oils in Section 16-21-28w4, on the Twin Dome structure. It is uncertain whether this is a northerly continuation of the Aldersyde structure or an independent folding.

Watson Structure

On the Watson structure west of Lundbreck, in the southern foothills, Mar Jon-Maxmont's No. 4, LSD 10, Section 20-9-2w5, has spudded and is running three tours. Raven Oils' No. 1, LSD 1, Section 20-9-2w5, is running casing to 1,400 feet. The pipe was secured from Athadome Oils' No. 2 in the Athabaska district. Mar Jon Oil Co.'s No. 3, LSD 3, Section 4-10-2w5, is resuming.

Tests in the Foothills

In the Forest Reserve area west of Olds, Hunter Valley Oil Co.'s No. 1 McLaren, LSD 12, Section 13-31-10w5, is below 4,240 feet. Early geological estimates placed the lime at 4,500 feet.

On the Highwood-Sinclair structure, Canadian Royalties' No. 1 Banner, LSD 6, Section 34-17-3w5, is hauling casing and putting camp in shape for winter drilling.

In the old Oil City Field, Waterton Lakes Park, Oil City Royalties' No. 1 Patrick, Section 30-1-30w4, is below 2,100 feet with a change in formation and samples showing a distinct sulphur odor.

Saskatchewan Test

In southern Saskatchewan, Simpson Oil Co.'s No. 2, near Simpson, is in overburden below 100 feet and expected to get rock formation around 127 feet.

Drilling in Ontario

In the Dawn Field, Lambton County, Ontario, Union Gas Co.'s No. 78, NW Lot 29, Concession 11, Dawn Township, finished a dry hole at 2,002 feet. In the east end of the field, Union's No. 34 Moorehouse, Lot 25, Concession 5, Euphemia Township, was deepened to 1,860 feet without increasing production. Union's No. 79, center of east line, Lot 25, Concession 9, Dawn Township, has started and is below 300 feet.

In Moore Township, Lambton County, American Engineering Co.'s No. 5, I. C. Kerr farm, Lot 21, Concession 1, is landing drive pipe at 200 feet.

In the Tilbury Field, Kent County, Ladd & Cabana's No. 1, Gifford farm, S half N half Lot 29, Concession 15, Tilbury East Township, is below 900 feet.

In the De Clute Field, Raleigh Township, Kent County, Union Gas Co.'s No. 25, SE Lot 17, Concession 15, is below 1,350 feet. Gas Producers Syndicate's No. 1, Gilbert Pardo farm, is around 1,350 feet.

In the Dover Field, Kent County, Medina Natural Gas Co.'s No. 1, Stirling lease, 200 feet from the south line and 150 feet from the west line, E half Lot 1, Concession 4, Dover Township, has started and is below 150 feet on a test of the Trenton limestone.

Saskatchewan Oil Strike

In northern Saskatchewan, what may prove to be an important oil strike is reported from a shallow test 4 miles southeast of Hudson Bay Junction. At 500 feet a tarry substance, at first identified with the Athabaska tar sands, was encountered; and on deepening to 610 feet, heavy asphaltic crude rose 100 feet in the hole. The substance resembles black axle grease and is practically free from sand. The gasoline content is estimated around 10 per cent. Samples have been sent to Ottawa and to the University of Saskatchewan at Saskatoon for analysis. Extensive leasing is being done and the

(Continued on Page 169)

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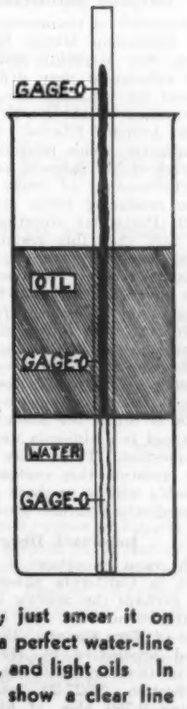

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Californians Discussing Depletion of Reserves as Discoveries Seem Less Likely in Future

By L. P. STOCKMAN
Staff Correspondent, California Fields

LOS ANGELES, Calif., Nov. 12.—There has been considerable discussion during the past few years regarding the abnormally large depletion of crude oil reserves in California and this subject has received so much consideration that many operators really believe we are headed for a rationing period within the next year or two. Let us review the facts and ascertain the real status of the situation in the light of what has materialized during the period in question. Statistics and geological research indicate the probability that there has been very little depletion in known reserves as there is ample evidence to support the statement that visible reserves today are almost, if not equal, to the known reserves in sight five years ago.

Since January 1, 1930, California has produced an aggregate of 900,016,631 bbls. of crude oil. Of this total 228,099,899 bbls. were produced in 1930, 188,829,032 bbls. in 1931, 178,127,794 bbls. in 1932, 173,083,319 bbls. in 1933, and 131,876,587 bbls. up to the end of September, 1934. Against this and offsetting this depletion we have recorded a number of outstanding discoveries during the period in question, some of which are of tremendous importance. It is a recognized fact, of course, that prospectors have not experienced the same degree of success that they had in the period immediately subsequent to 1919 and may never again succeed in discovering so many prolific fields in California in so short a period of time.

Increased Recoverable Reserves

Discovery of commercial production in the Kettleman Middle Dome, Mountain View, San Miguelito and Edison Fields and subsequent deep drilling which has proved up the existence of deeper prolific zones in the North Belridge, Ventura Avenue, Elwood, Inglewood, and Dominguez Fields has added an amount of recoverable reserves practically equal to the amount of crude oil withdrawn from producing fields since January 1, 1930. Particular attention is directed to the fact that this resume is concerned with visible reserves as separate from ultimate recovery because in the latter case no argument can be advanced to dispute the axiomatic fact that every barrel of crude oil produced obviously reduces the future ultimate recovery. It is the contention, however, and this can be supported by a conservative survey, that sufficient new discoveries have been made to offset the amount of crude oil produced in California during the period in question. There may be some who may question this contention and there probably will be as there are many ways of predicating future production.

Important Discoveries

The most important of the discoveries made in California subsequent to 1930 was perhaps the proving up of two deep prolific zones in the North Belridge Field of Kern County. The Temblor was found productive by the Belridge Oil Co. in October, 1930, when its No. 15 in Section 26-27-20 was brought in flowing 2,750 bbls. of high gravity oil per day from 5,547 feet. With the exception of the discovery of the Kettleman North Dome Field, this was the most important discovery in the San Joaquin Basin in many years. Belridge Oil Co. followed up this success by proving up the underlying Eocene as highly productive in June, 1932. The discovery well in the Wagonwheel zone of Eocene age was No. 64-27, which was completed under wraps doing 2,500 bbls. of 43.1 gravity oil and approximately 50,000,000 feet of gas per day from 8,062 feet. This deep well was shut in immediately after completion. These discoveries made subsequent to January 1, 1930, probably added 200,000,000 bbls. to the recoverable reserves of the State and will offset some of the depletion recorded in other fields during the period in question.

The development of commercial production in the Kettleman Middle Dome by Standard Oil Co. is another important discovery made during the last five years. The initial well, No. 6-29-V, was completed flowing 1,245 bbls. per day from 7,825 feet in April, 1932. It was deepened to 8,385 feet in June, 1932, and recompleted doing 1,250 bbls. per day in April, 1933, after the hole had been plugged back to 7,835 feet. The Petroleum Securities was the first to reveal the existence of a substantial accumulation in the Middle Dome but was unable to complete the discovery well due to a complicated fishing job which developed at the last moment. A corporation was formed by operators in the Middle Dome in order to facilitate development work but the operating company will not begin functioning until all drilling costs incurred up to date have been liquidated. Due to the limited amount of drilling undertaken up to the present, it is practically impossible to prognosticate the probable ultimate recovery of the Middle Dome with any degree of accuracy but the field should be good for at least 100,000,000 bbls. of crude oil with a strong probability that deeper drilling may greatly increase the estimate just made.

Other Discoveries

Other important discoveries in California since 1930 include the proving up of new fields at San Miguelito in Ventura County and at Mountain View and Edison in Kern County. These fields appear to be of secondary importance although subsequent drilling may change the aspect at a later date. Chanslor Canfield Midway Oil Co. really finished the first producing well in the San Miguelito Field of Ventura County although at the time the well was considered an outpost in the Rincon Field. The initial test of the Chanslor Canfield Midway Oil Co. was good for only about 150 bbls. per day on the beam after being plugged back several thousand feet. This well drilled through the fault outlining the northern limits of the field due to an abnormal deviation from the vertical and finally wound up almost where it started from as far as depth is concerned. The displacement on the north side of the fault was downward and consequently when the well passed through the fault it picked up the same zone that it had encountered about 3,000 feet higher up on the south side of the fault. Continental Oil Co. finished the first good well in the San Miguelito Field and appears to hold practically all of the productive acreage in the field, which incidentally will prove to be rather limited in areal extent.

The probable productivity of the Mountain View Field, southeast of Bakersfield, and the Edison Field, slightly northeast of Mountain View, is more or less problematical as the limits of production have not been established. Both fields, however, should give a good account of themselves from a production standpoint notwithstanding the fact that drilling operations are being retarded in the interests of conservation. The extreme western end of the Mountain View Field seems to be the most highly productive and consequently the trend in this direction may be the key to the situation. Edison is still an enigma but dry holes have indicated that the productive area will not be as large as originally expected. This field should become of more importance than most operators expect, however, due to the shallow depth at which production is secured.

Deeper Zones

Deep zone exploitation has been an important factor in California production during the past few years with the result that deeper drilling in proven fields has made up for the deficiency in new discoveries. Important discoveries as a result of deep drilling have been made in the Ventura Avenue, Domingues and Inglewood Fields, and while lower productive horizons have been more or less expected they did not become realities until the drill actually picked them up. In addition to these deep zone discoveries, the Barnsdall and Rio Grande, jointly developing acreage in the Elwood Field of Santa Barbara County, finished a good well in the Sespe rocks in October, 1931, and thereby proved the existence of a second zone in this field. Operators have not prosecuted development of the Sespe in the Elwood Field due to the prevailing low price of crude oil but will do so whenever the price of crude is commensurate with its intrinsic value from a refining standpoint.

The Associated Oil Co. proved the existence of a highly productive horizon in the Ventura Avenue Field when No. 57 Lloyd was brought in flowing 4,850 bbls. of 33.5 gravity oil per day from 8,823 feet in April, 1931. In July, 1932, the Associated finished No. 83 Lloyd in the 57 zone and this well was finished flowing 5,500 bbls. of clean 34.6 gravity oil per day from 9,709 feet. The well was cleaned out and returned to production flowing 6,270 bbls. per day. This deep zone, like the Sespe at Elwood, has not undergone any intensive development and its true value is therefore underestimated by many. Development of the deep zones at Dominguez and Inglewood was more or less a formality as their existence was practically a sure shot. Drilling operations have nevertheless proved the existence of productive zones that were not visible on January 1, 1930. After a careful check of deep zone discoveries and the new recoverable production added as a result of new finds, one cannot but be impressed by the fact that the visible reserves of California today are almost if not equal to the visible reserves in sight at the beginning of 1930.

Santa Barbara

The Santa Barbara Mesa Field, a few miles outside of the city of Santa Barbara, came to life with a bang this week and operators are still wondering what it is all about. During the past few months a number of exceptionally good wells have been finished in this field, and while most of them were good for about 1,500 bbls. per day, many operators were of the opinion, in view of past experiences, that these recent completions would prove to be a flash in the pan and show a rapid decline. Up to the present this has been true, but imagine the embarrassment of some when Fairacres Oil Co.'s No. 1 Anchordoquy blew in prematurely several days ago flowing wild at the rate of approximately 8,000 bbls. per day and painted the landscape in good shape before it sanded up. This new well blew in wild while the crew was making a water shutoff test from 2,031 feet following the landing and cementing of a 5⅝-inch water string which was set at 1,965 feet.

The Fairacres Oil Co.'s new well is by far the largest completion in the Santa Barbara Mesa Field since its discovery several years ago and tends to confirm the belief of some that drilling

TANKER SHIPMENTS FROM LOS ANGELES TO DOMESTIC AND FOREIGN PORTS

	October 28		October 21			
	Total this week	Daily average	Total last week	Daily average	This year to date	Same time last year
Intercoastal-domestic—						
Fuel oil	315,295	45,042	.....	.....	10,985,479	2,287,670
Diesel and gas oil	.....	.....	.....	.....	1,098,288	1,200,559
Gasoline	320,726	45,818	213,042	29,006	6,672,127	9,149,898
Kerosene	20,349	2,907	79,864	11,409	898,666	746,849
Asphalt	.....	.....	.....	.....	70,019	12,179
Other finished oil	.....	.....	.....	.....	54,778	90,557
Other unfinished oil	.....	.....	.....	.....	.....	72,584
Foreign exports—						
Crude oil	260,630	37,233	2,616	374	6,540,827	6,222,650
Fuel oil	172,931	24,704	86,258	12,322	10,701,955	6,652,208
Diesel and gas oil	93,491	13,356	21,837	3,120	3,347,333	2,837,718
Gasoline	15,106	2,158	130,350	18,621	3,738,465	4,669,820
Kerosene	.....	.....	15,339	2,191	1,461,730	1,621,386
Other finished oil	.....	.....	.....	.....	37,955	12,086
Other unfinished oil	75,383	10,340	.....	.....	224,275	66,375
Coastwise-domestic—						
Crude oil	64,310	9,187	.....	.....	6,998,875	5,891,821
Fuel oil	95,339	13,620	325,095	46,871	7,936,759	8,593,621
Diesel and gas oil	16,095	2,299	4,669	667	603,864	921,715
Gasoline	312,713	44,816	385,089	55,013	10,937,646	10,553,731
Kerosene	6,207	887	.....	.....	130,537	158,663
Naphtha distillates	.....	.....	.....	.....	.....	27,651

TANKER SHIPMENTS FROM SAN FRANCISCO TO DOMESTIC AND FOREIGN PORTS

Intercoastal-domestic—						
Fuel oil	.....	.....	.....	.....	110,650	.....
Diesel and gas oil	73,325	10,475	.....	.....	599,613	603,697
Gasoline	.....	.....	74,453	10,637	365,283	804,548
Kerosene	181	26	.....	.....	276,593	482,430
Lubricants	.....	.....	11,998	1,714	46,693	33,934
Foreign exports—						
Crude oil	.....	.....	38,304	5,472	1,601,165	1,618,886
Fuel oil	137,917	19,702	82,079	11,868	1,859,969	1,644,419
Diesel and gas oil	.....	.....	16,154	2,308	1,164,102	907,646
Gasoline	9,489	1,356	184,323	26,332	2,605,526	3,382,787
Kerosene	.....	.....	128,394	18,342	1,004,660	841,225
Lubricants	323	48	17,811	2,544	161,291	102,723
Other finished oil	.....	.....	.....	.....	2,760	3,745
Other unfinished oil	.....	.....	.....	.....	5,750	26,278
Coastwise-domestic—						
Fuel oil	182,981	26,140	.....	.....	4,575,543	2,958,067
Diesel and gas oil	.....	.....	.....	.....	119,036	189,323
Gasoline	153,782	21,969	140,539	20,077	4,566,825	3,468,865
Kerosene	4,992	713	2,987	427	83,434	98,185

operations up to the present have been around the edges of the field and have failed to reveal the real potentialities of the district. No. 1 Anchordoquy, by the way, is believed to have penetrated the greatest thickness of oil sand in the field, and this may mean quite a lot as the bit was still in the pay when drilling was concluded at 2,031 feet.

No Conformability

Subsurface conditions in the Mesa Field are characterized by an utter lack of any semblance of conformity and drilling operations up to the present indicate the possible existence of a major fault which may dominate structural conditions. Production to date has been secured in the Vaqueros rock, and since no dry holes have been drilled on top of the structure, the potentiality of the underlying Sespe is undetermined. Development work under way in the Santa Barbara Mesa Field has proven unusually interesting during the past several months in view of the fact that early work proved somewhat unsatisfactory and resulted in substantial losses due to the inability to develop sustained production. A number of major operators got quite hot on the field immediately following its discovery a few years ago but after drilling several failures their enthusiasm cooled off and they later pulled out and charged off their losses to experience.

For some time after the drilling of several dry holes during the initial period, the Santa Barbara Mesa Field was more or less inactive, although a few of the more aggressive operators continued to feel their way along slowly by drilling a new well now and then. This early drilling was marked by indifferent results but early this year the field came back to life following completion of an unusually good well and from that time on the Mesa has continued to become of more importance. The new well of the Fairacres Oil Co., considering its location and other wells drilled in the immediate vicinity, is almost beyond comprehension and its real significance can not yet be appreciated. In view of past experience, one cannot but wonder whether it is indicative of a substantial accumulation or merely reflects a localized condition. It might be well to watch developments in this field during the next few weeks as the showing of No. 1 Anchordoquy may be the forerunner of other completions which may likewise show substantial production.

Pending Completions

There are a number of other potential producers nearing completion in the Santa Barbara Mesa Field and while some of them may show relatively large production, operators will follow the outcome of drilling operations by the Rio Grande Oil Co. on the Perkins lease. This company's first project on the Perkins lease has just been cemented on top of the pay and should be ready for a production test within 10 days. This well should show rather conclusively whether

IMPORTANT NORTHERN CALIFORNIA WILDCATS

Company, well and location—	S-T-R	Depth	Status
General Pet. Co., No. 11 Capitan, Santa Barbara Co.	32- 5-30	3,048	sd. sh. drlg.
Shell Oil Co., No. 2 Capitan, Santa Barbara Co.	32- 5-30	2,500	gr. sd. drlg.
Royalty Serv. Corp., No. 1 Los Alamos, Santa Barbara Co.	35- 9-32	3,388	hd. sh. drlg.
Union Oil Co., No. 3 Santa Maria, Santa Barbara Co.	35-10-34	rig	rigging up
Signal Oil & Gas Co., No. 1 Elwood, Santa Barbara Co.	tideland	3,601	sd. sh. drlg.
Barnsdall-Rio Grande, No. 8 Doty Elwood, Santa Barb. Co.	15- 4-29	5,732	redrlg. 1,825 ft.
East Elwood Pet. Co., No. 1 Elwood, Santa Barbara Co.	14- 4-29	3,656	suspended
Shell Oil Co., No. 1 Goleta, Santa Barbara Co.	20- 4-28	4,701	rd. sd. drlg.
Standard Oil Co., No. 2 Goleta, Santa Barbara Co.	17- 4-28	4,850	redrlg. 3,539 ft.
Ortega Oil Co., No. 1 Summerland, Santa Barbara Co.	16- 4-26	4,325	rd. sh. drlg.
Woodrow Pet., No. 1 Rincon, Ventura Co.	4- 3-24	7,612	suspended
Continental, No. 3 San Miguelito, Ventura Co.	23- 3-24	7,015	plug 5,100 ft.
Las Posas Pet., No. 1 Las Posas, Ventura Co.	22- 3-20	7,370	fishing
Fisher, Daniel, No. 1 South Mountain, Ventura Co.	5- 3-19	660	sd. sh. drlg.
The Texas Co., No. 128 South Mountain, Ventura Co.	4- 3-19	4,466	rd. sh. drlg.
Oil Ridge Oil Co., No. 1 Fillmore, Ventura Co.	1- 4-19	1,380	cleaning out
Bolsa Chica Oil Co., No. 2 Piru, Ventura Co.	4- 4-16	614	fishing
Piru Oil Co., No. 1 Piru, Ventura Co.	14- 4-18	2,452	hd. sh. drlg.
American Drilling Co., No. 1 Simi, Ventura Co.	6- 2-17	903	suspended
Dawson Oil Co., No. 1 Simi, Ventura Co.	5- 2-17	1,795	fishing
Rancho Oil, Inc., No. 1 Ojai, Ventura Co.	18- 4-23	2,410	hd. sd. drlg.
Continental Oil Co., No. 1 Ojai, Ventura Co.	12- 4-23	416	sd. sh. drlg.
Prop. Service Corp., No. 1 Lloyd, Ventura Co.	24- 3-23	7,060	O.S. drlg.
Mosher, J. W., No. 1 Santa Paula, Ventura Co.	22- 4-21	2,300	reaming
Casa Mira Oil Co., No. 1 Belridge, Kern Co.	29-28-20	6,495	hd. sh. drlg.
General Pet., No. 1 South Belridge, Kern Co.	30-28-21	11,377	suspended
Union Oil Co., No. 18 North Belridge, Kern Co.	36-27-20	8,523	fishing D.P.
Standard Oil Co., No. 1-A North Belridge, Kern Co.	36-27-20	3,520	sd. sh. drlg.
Amerada Pet., No. 1 Blackwells Corner, Kern Co.	17-26-19	2,723	will deepen
Home Corp., No. 1 McFarland, Kern Co.	16-26-27	2,102	suspended
Ohio Oil Co., No. 1 McVan, Kern Co.	32-27-27	1,364	bailing
Peli Oil Co., No. 1 McVan, Kern Co.	14-27-27	1,161	sd. sh. drlg.
Buckeye Union Oil Co., No. 1 McVan, Kern Co.	11-27-27	1,158	sd. sh. drlg.
Hancock Oil Co., No. 1 Mountain View, Kern Co.	14-30-28	4,199	sd. sh. drlg.
Associated Oil Co., No. 1 Mountain View, Kern Co.	3-31-29	2,640	sd. sh. drlg.
Associated Oil Co., No. 2 Mountain View, Kern Co.	14-30-28	2,810	sd. sh. drlg.
Union Oil Co., No. 3 Mountain View, Kern Co.	23-30-28	5,390	sd. sh. drlg.
Union Oil Co., No. 4 Mountain View, Kern Co.	15-30-28	3,821	sd. sh. drlg.
Union Oil Co., No. 5 Mountain View, Kern Co.	15-30-28	....	location
The Texas Co., No. 3 Mountain View, Kern Co.	14-30-27	5,389	cmtd.
Barnsdall, No. 3 Mountain View, Kern Co.	31-30-29	4,580	sd. sh. drlg.
Hogan Pet., No. 6 Mountain View, Kern Co.	4-31-29	mtl.	bldg. rig
Standard Oil Co., No. 3 Mountain View, Kern Co.	23-30-28	5,526	cleaning out
National Oil Co., No. 1 Mountain View, Kern Co.	30-30-29	5,604	suspended
Gilmore-Snyder Oil Co., No. 2 Mountain View, Kern Co.	24-30-28	rig	rigging up
Gilco, Inc., No. 2 Edison, Kern Co.	23-30-29	2,130	cleaning out
Jergins Trust, No. 2 Edison, Kern Co.	14-30-29	1,560	pump 200 b.d.
Jergins Trust, No. 3 Edison, Kern Co.	14-30-29	rig	rigging up
Jergins Trust, No. 4 Edison, Kern Co.	24-30-29	rig	suspended
Herndon Oil Co., No. 1 Edison, Kern Co.	17-30-29	mtl.	bldg. rig
Shell Oil Co., No. 1 Edison, Kern Co.	16-30-29	4,276	prod. test
Monterey Expl. Co., No. 4 Edison, Kern Co.	15-30-29	rig	suspended
The Texas Co., No. 1 Edison, Kern Co.	4-30-29	....	foundation
Centralia Oil Co., No. 2 Edison, Kern Co.	26-30-29	rig	suspended
North American, No. 1 Edison, Kern Co.	14-30-29	265	sd. drlg.
General Pet., No. 1 Edison, Kern Co.	14-30-29	1,905	sd. sh. drlg.
General Pet., No. 2 Edison, Kern Co.	15-30-29	rig	suspended
Lee Oil Co., No. 1 Edison, Kern Co.	6-30-29	4,025	cmtd.
Sea Cliff Oil Co., No. 1 Greenfield, Kern Co.	7-31-28	....	foundation
Tejon Ridge Oil Co., No. 1 Comanche, Kern Co.	23-32-29	1,350	suspended
Standard Oil Co., No. 1 Semi-Tropic, Kern Co.	8-27-23	rig	rigging up
101 Oil Co., No. 1 Elk Hills, Kern Co.	5-30-24	rig	rigged up
The Texas Co., No. 1 Temblor, Kern Co.	29-29-21	....	location
Shell Oil Co., No. 1 Buena Vista, Kern Co.	3-32-25	....	location
Badger Oil Co., No. 1 Wheeler Ridge, Kern Co.	31-11-25	6,258	redrlg.
Russ Oil Synd., No. 1 Kingsburg, Fresno Co.	28-12-11	4,470	hd. sh. drlg.
Bergman, Harry, No. 1 Kingsburg, Fresno Co.	12-12-11	6,138	suspended
Union Oil Co., No. 1 Lillis-Kettleman, Fresno Co.	24-21-16	10,944	redrlg. 8,129 ft.
K. N. D. A., No. 56 Kettleman, Kings Co.	8-22-18	10,154	redrlg. 9,425 ft.
The Texas Co., No. 1 Coalinga, Fresno Co.	35-20-14	101	sh. drlg.
Western Gulf, No. 2 S. P., Fresno Co.	11-17-15	6,709	sidetracking
Farrel Pet., well No. 1 San Luis Obispo Co.	18-31-12	1,256	hd. sh. drlg.
Commonwealth Consd. Gas Co., No. 1 Tulare Lake, Kings Co.	21-22-20	2,490	gas—shut in
Commonwealth Consd. Gas Co., No. 3 Tulare Lake, Kings Co.	21-22-20	rig	suspended
Kettleman Pac. Oil Co., No. 1 Tulare Lake, Kings Co.	11-23-16	812	sd. sh. drlg.
Trico Oil & Gas Co., No. 1 Alpaugh, Kings Co.	33-24-22	3,712	suspended
Trico Oil & Gas Co., No. 2 Alpaugh, Kings Co.	3-25-22	2,480	cmtd. 2,422 ft.
Buttes Oilfields Co., No. 2 Marysville, Sutter Co.	35-16- 1	5,615	hd. sh. drlg.
Millham Exploration Co., No. 3 Tracy, San Joaquin Co.	24- 3- 4	2,710	sd. sh. drlg.
Pure Oil Co., No. 1 Chowchilla, Madera Co.	7-10-14	8,220	cmtd.
Northern Counties Pet., No. 1 Tehama, Tehama Co.	25-24-3	1,812	hd. sh. drlg.
The Texas Co., No. 1 Petrolia, Humboldt Co.	1- 3- 2	....	location

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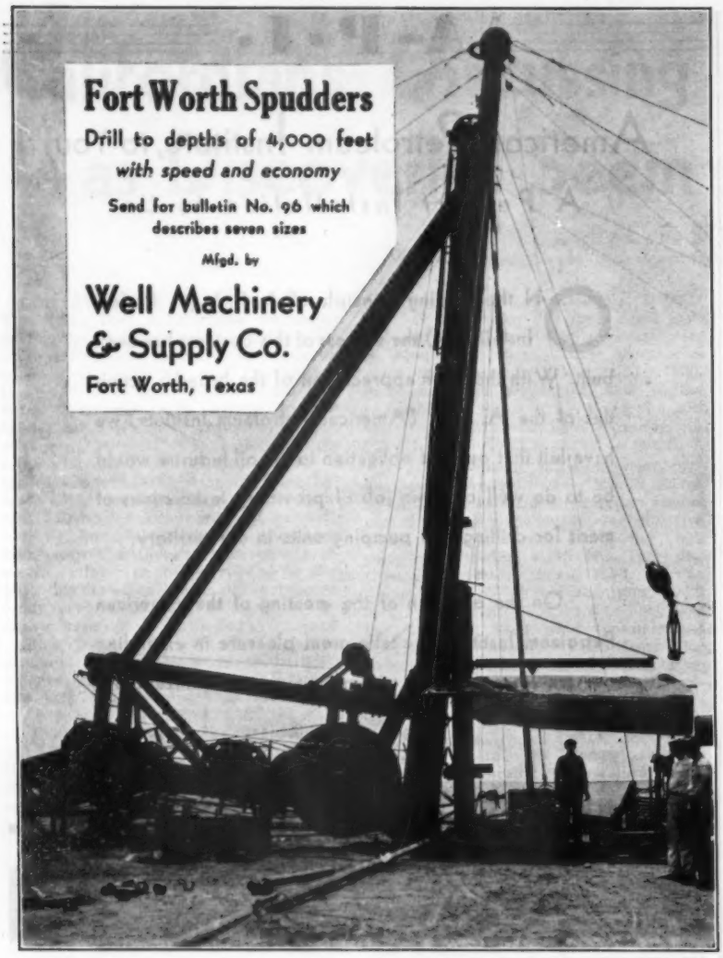

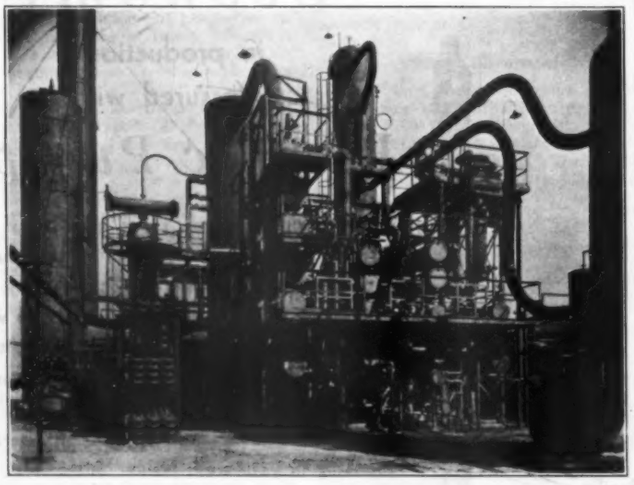

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the Santa Barbara Mesa Field is destined to be lifted out of the secondary class and become of primary importance. Allied Petroleum Co.'s No. 16 Mesa, E. C. Arnold's No. 1 Adams, Bastanchury Oil Co.'s No. 1, Jordan & Mainey's No. 1 Nye, Midcoast Oil Co.'s No. 3 Rogers and C. L. Ross' No. 1 Adams should be finished within the next 15 days and the production developed may throw further light on the future potentialities of this field.

Most of these wells are only scheduled to take the normal penetration but if one or two should drill another 25 feet they may reveal something of importance. During the early part of the current week, two wells were put on production tests in this field but only one of them was a new completion. This was Fornachon & Wilson's No. 1 Mesa, which was brought in doing 655 bbls. of clean 18.9 gravity oil per day from 2,050 feet. The well died a few days after completion, however, and the crew is cleaning out preparatory to recompleting it. Trans-Oceanic Oil Co. recompleted No. 1 Morrison, and this well, originally finished in October, was returned to production pumping 249 bbls. of 17.8 gravity oil per day after the hole had been deepened from 2,025 feet to 2,049 feet.

Huntington Beach

The Standard Oil Co. added an excellent well to its list of producers in the Huntington Beach Field this week when No. 69-B was brought in flowing 2,165 bbls. of clean 25.3 gravity oil and 3,060,000 feet of gas per day from 4,350 feet after the hole had been finished with a 4¾-inch liner including 708 feet of perforated. In the Santa Fe Springs Field, Pedro Petroleum Co. finished No. 3 Fulton pumping 248 bbls. of 33.1 gravity oil per day from 4,505 feet. Two new wells were completed in the Long Beach Field and both of them were fairly good producers. D. D. Dunlap's No. 9 Signal was finished pumping 339 bbls. of 26.5 gravity oil cutting 5 per cent from 4,205 feet, and Ohenstein & Wither's No. 2-A Signal was completed pumping 222 bbls. of 27.2 gravity oil per day from 4,494 feet. The Standard completed an excellent new well in the West Coyote Field a few days ago when No. 116 Murphy-Coyote was brought in under a natural flow doing 1,260 bbls. of relatively clean 32.6 gravity oil per day after the hole had been finished with a 6⅝-inch liner carrying 739 feet of perforated.

Numerous Completions

The current week witnessed another large group of completions spread over a number of fields throughout the State and a check indicates that another formidable list of new wells will be finished during the next fortnight. New wells were chalked up this week in the West Coyote, Huntington Beach, Long Beach, Santa Fe Springs, Fruitvale, Mountain View, Mount Poso, Ventura Avenue, Santa Barbara Mesa and Kettleman North Dome Fields. It is evident from this list that the depth and initial production of new wells showed a wide range and, due to aggressive development in several fields, this condition will prevail for some time to come. Completions in the Kettleman North Dome Field have not been any too numerous during the past six weeks but operators will make up for this lost time between now and the end of the year. The North Dome has a rated potential of 474,960 bbls. at present, but if operators succeed in finishing the number of new wells scheduled for completions within the next six weeks the potential daily production of this field will exceed 500,000 bbls. before the advent of the new year.

Fruitvale

It has been so long since a large well has been finished in the Fruitvale Field of Kern County that most operators have come to the conclusion that field was of no consequence. The field went over the top as far as peak production is concerned a couple of years ago, but the Western Gulf's completion this week indicates that there is still room for a good completion now and then. This new well, No. 14-B on the Kern County Land Co. property, was brought in flowing 1,405 bbls. of clean 19.2 gravity oil per day from 3,601 feet. It was finished with a 6⅝-inch liner carrying 266 feet of perforated. Two new wells were chalked up in the Mount Poso Field this week and both of them registered normal production. The Shell's No. 9 Security, bottomed at 1,803 feet but plugged back to 1,765 feet, was brought in pumping 347 bbls. of 16.4 gravity oil per day. D. T. Turner's No. 1 Glide was completed pumping 398 bbls. of 16.2 gravity oil per day from 1,958 feet.

Ventura Avenue

Shell Oil Co. proved that the upper zone in the Ventura Avenue Field is still good for substantial production, provided one picks the right spot, by finishing No. 82 Taylor, flowing 1,747 bbls. of clean 30.4 gravity oil per day from 5,550 feet. This hole was finished with an 8⅝-inch liner carrying 835 feet of perforated. There are several other potential producers nearing completion in this field and they should be tanking oil in the near future. Some of the wells headed down to the deep 57 zone have encountered mechanical trouble and their completion will consequently be delayed until the fish has been recovered.

Up in the Kettleman North Dome Field, the Standard has finished No. 87-29-J flowing 2,187 bbls. of clean 31.7 gravity oil per day from 8,170 feet. The oil string in this hole was perforated at 7,188-7,308 feet, 7,394-7,518 feet and at 7,673-8,165 feet. Wilshire Oil Co. is swabbing its deep test in the Potrero Field, and while the outcome is still in doubt, this deep Miocene test may bear watching as it has shown plenty of kick. On a preliminary test several weeks ago, the well came in wet, but corrective measures have since been undertaken. This well is being drilled on a lease quitclaimed by the Associated Oil Co. a few years ago because of the inability to develop sustained production.

IMPORTANT SOUTHERN CALIFORNIA WILDCATS

Company, well and location—	S-T-R	Depth	Status
Clayton, G. L., No. 1 Cerritos, Los Angeles Co.	31- 3-12	6,698	suspended
Kelly & Son, No. 1 Torrance, Los Angeles Co.	7- 4-13	6,605	sd. sh. drlg.
Houser, G. W., No. 1 Athens, Los Angeles Co.	18- 3-14	4,037	cleaning out
Wilshire Oil Co., No. 2 Potrero Deep, Los Angeles Co.	27- 2-14	7,985	fish out
Fourl, C. W., No. 1 Del Rey, Los Angeles Co.	27- 2-15	6,445	will cmt.
Big Ben Oil Co., No. 1 Del Rey, Los Angeles Co.	27- 2-15	....	foundation
Staple Oil Co., No. 1 Manhattan, Los Angeles Co.	24- 3-15	4,660	redrlg. 3,210 ft.
Standard Oil Co., No. 1 Montebello Deep, Los Angeles Co.	6- 2-11	8,220	gr. sd. drlg.
Universal Consd. No. 4 Montebello Deep, Los Angeles Co.	6- 2-11	....	foundation
Shively, N. O., No. 1 Puente Hills, Los Angeles Co.	23- 2-10	rig	rigging up
Deep Rock Oil Co., No. 1 Puente Hills, Los Angeles Co.	23- 2-10	2,540	plug 2,524 ft.
Pressel & Tull, No. 1 Puente Hills, Los Angeles Co.	30- 2- 9	3,875	hr. sh. drlg.
Barstow Oil Co., No. 2 Saugus, Los Angeles Co.	35- 5-16	2,400	suspended
International Dev. Co., No. 1 Saugus, Los Angeles Co.	34- 5-16	3,350	fishing
Black Eagle Oil Co., No. 1 Huntington, Orange Co.	tideland	4,012	suspended
Explorers Drilling Co., No. 1 Fairview, Orange Co.	9- 6-10	945	suspended
Nuell Co., No. 1 Newport, Orange Co.	29- 6-10	6,485	fishing D.P.
B. & B. Oil Co., No. 1 Newport, Orange Co.	19- 6-10	509	cmtd.
Platt & Collins, No. 1 Costa Mesa, Orange Co.	14- 6-10	2,566	suspended
Mid-Rich Drlg. Co., No. 1 Atwood, Orange Co.	26- 3- 9	4,019	suspended
Bridger, J., No. 1 Coyote, Orange Co.	15- 3-10	5,410	suspended
Great American Pet. Co., No. 2 East Coyote, Orange Co.	19- 3- 9	1,225	sd. sh. drlg.
Great American Pet. Co., No. 1 Chino, San Bernardino Co.	18- 2- 8	2,462	suspended
Great American Pet. Co., No. 3 Chino, San Bernardino Co.	7- 2- 8	230	hd. sh. drlg.
Tehama Pet., No. 1 Santa Ana Canyon, S. Bernardino Co.	33- 2- 8	2,698	plug. 2,680 ft.
San Diego Pet. Co., No. 1 Chula Vista, San Diego Co.	33-18- 2	5,712	hd. sd. drlg.
Edmonds, E. A., No. 1 trustee, San Diego Co.	29-15- 3	2,208	hd. sd. drlg.
Everts Drlg. Co., No. 1 Camp Kearney, San Diego Co.	23-15- 3	793	sd. sh. drlg.
Great Coastal Oil Co., No. 1 Elsinore, Riverside Co.	36- 5- 5	105	sd. sh. drlg.

Giant Producers Are Completed in Fitts Pool, and More Big Ones in South Burbank Area

By JAMES McINTYRE

The big news of the week in the Oklahoma fields came out of the Fitts Pool and the South Burbank Pool.

The Deep Rock Oil Co. has one of the largest initial producers thus far drilled in the Fitts Pool in Pontotoc County. Its No. 1 Dawes Harden, C NW SE NE Section 30-2-7, came in producing 2,565 bbls. in five and one-half hours, part of the time pinched in and producing through tubing. The well made a peak of 680 bbls. in one hour and in two other hours made 650 bbls. per hour through 7-inch casing. Then it was flowed through tubing. It looks as if the well might have produced from 13,000 to 15,000 bbls. if permitted to produce wide open for 24 hours. It had Simpson sand at 4,100-60 feet and a sand at 4,241-44 feet, total depth. The well showed gas at the rate of 20,000,000 feet per day.

Blackstock and others' No. 2 Harden, C SW SE NW Section 30-2-7, in the Fitts Pool, produced for six and one-half hours at the rate of 7,320 bbls. a day and was then shut in. It made 1,982 bbls. in six and one-half hours. Bromide was topped at 4,060 feet and sands were found at 4,160-90 and 4,245-48 feet, total depth 4,300 feet. It also showed gas at the rate of 3,000,000 feet per day.

Late reports from the South Burbank Field in Osage County shows Enterprise Transit Co.'s (Kewanee Oil & Gas Co.) No. 1, SW cor. Section 35-26-6, as having gauged 2,653 bbls. in 24 hours from Burbank sand at 2,763-2,832 feet and Carter Oil Co.'s No. 2, NW cor. Section 2-25-6, 2,774 bbls. in 24 hours from Burbank sand at 2,760-2,835 feet.

Estimated Production

Estimated production by pools in Oklahoma for the week ending November 10 and for the preceding week follows:

	Barrels	
	Nov. 10	Nov. 3
Allen	7,650	7,100
Asher-West Asher	1,550	1,625
Burbank	9,100	9,100
South Burbank	10,250	8,750
Balance of Osage	25,000	25,000
Blackwell	4,800	4,800
Bristow-Slick	10,250	10,250
Crescent	2,925	3,650
Cromwell	4,400	4,400
Cushing-Shamrock	13,500	13,500
Chandler district	6,000	6,000
Duncan district	4,300	4,300
Fish	4,125	3,675
Fitts	2,050	950
Gray	1,475	1,175
Graham	3,600	3,650
Healdton	9,250	9,250
Hewitt	4,750	4,750
Holdenville	2,600	2,600
Keokuk	600	800
Konawa	2,050	1,850
Lucien	6,075	6,550
Marshall-Lovell	1,100	1,100
Oklahoma City	151,350	108,950
Papoose	1,250	1,250
Sholem-Alechem	4,100	4,100
Seminole Field:		
Bowlegs	9,600	9,275
Carr City	3,200	3,200
Earlsboro	8,275	8,350
East Earlsboro	8,075	8,950
South Earlsboro	875	475
Little River	12,300	10,825
East Little River	575	475
Maud	1,150	975
Mission	2,625	3,500
Seminole	9,450	8,050
East Seminole	1,175	1,075
Searight	3,200	2,075
Total Seminole	60,500	53,225
St. Louis-Pearson	19,750	15,800
Tatums	6,300	5,700
Tonkawa-Garber-Thomas	6,300	6,300
Wewoka	4,200	4,200
Yale-Jennings	4,750	4,750
Other pools	65,975	61,350
Total Oklahoma	458,950	400,450

Osage County

Kewanee Oil & Gas Co.'s No. 2 Kennedy, SE cor. Section 34-26-6, South Burbank Field in Osage County, was completed. It produced 2,396 bbls. of oil in 24 hours from Burbank sand at 2,785-2,871 feet. It was not shot.

Champlin Refining Co. completed No. 1 Fletcher, SE cor. Section 4-25-6, in the South Burbank Field. It flowed 3,026 bbls. of oil naturally in 24 hours from Burbank sand at 2,690-2,725 feet.

H. F. Worley's No. 3, SE SE SW Section 16-25-6, had Burbank sand at 2,789-2,801 feet and flowed 147 bbls. naturally in 24 hours. It was completed. Sinclair Prairie Oil Co. made a location for No. 5 Burbank, NW NE NW Section 22-25-6.

The Texas Co. and Sinclair Prairie Oil Co.'s No. 10 Stroud, SW NE NW Section 30-25-8, was shot in chat at 2,443-68 feet and swabbed 115 bbls. of oil and salt water. It was completed.

Mead Oil Co. has rig up for No. 4, SE NW NE Section 22-24-8.

Comail Oil Co.'s No. 4, SW NE SW Section 32-22-8, was completed. It was shot with 45 quarts in sand at 2,237-87 feet and flowed 150 bbls. of oil in 24 hours.

Johnson Oil & Refining Co.'s No. 2, C N half NW SE Section 30-21-9, was a hole full of water from sand at 340-46 feet and was abandoned, but the company had much better luck with its No. 3 on the lease, 796 feet south and 300 feet east of C Section 30, as it started off at 112 bbls. per day, with 65 bbls. of water from the same sand at 315-35 feet, which had been shot with 90 quarts.

I. D. Simons and others made a location for No. 6, NE NE NW Section 2-21-8. Johnson Oil & Refining Co. made location for No. 4, SE SW NW SE Section 30-21-9, and for No. 5, CEL SW NW SE Section 30-21-9. M. Ringold made a location for No. 6 Turkey Island, NE SE SW Section 30-21-9.

Stanolind Oil & Gas Co.'s No. 1 DeBord, NW NW SW Section 27-22-2w, Polo Pool, Noble County, flowed 1,223 bbls. in 24 hours from Wilcox sand at 4,885-90 feet.

Creek County

William Sherry's No. 3 Halsey, CNL S half NW SE Section 28-19-9, Creek County, got a hole full of water from Wilcox sand at 2,807-23 feet and was abandoned.

Fred Gray's No. 1 James, SW NE SW Section 9-17-8, in the Olive Pool, is a 15-bbl. completion in Red Fork sand at 2,678-2,702 feet.

J. E. Crosbie's No. 1-A Watson, NW NW SE Section 10-17-8, was abandoned in Wilcox sand at 3,499-3,520 feet, when the hole filled with water.

Doke & Hughes have a 60-bbl. initial producer in No. 5 Watson, SW NW NW Section 10-17-8, a completion.

Murta, Sherry and others' No. 5 Cruel, SE SW NE Section 36-17-11, was shot in Wilcox sand at 2,651-60 feet, and looked like a 75-bbl. well.

S. W. Anthony's No. 4 Muskogee, C NE NE Section 9-16-12, in the Mounds district, was abandoned when Wilcox sand at 2,344-64 feet filled the hole with water.

New work in the county included Wood Oil Co.'s No. 11 Smith-Doolin, a twin, SW NW NW SE Section 2-19-7, drilling at 600 feet. Hancock & Thomas' No. 7 Williams, SW SE SE Section 24-17-8, drilling at 200 feet.

Tulsa and Wagoner Counties

Basinger and others were rigged up to start No. 1-B Withers, SW cor. Section 25-17-12, Tulsa County. Same company completed a 4,500,000-foot gas well in No. 1 DePriest, NE cor. Section 35-17-12, in Oswego sand at 789-97 feet.

Cummings Brothers completed a 20-bbl. well in No. 2 Buck, C N half N half SW Section 35-17-12, in Wilcox sand at 2,027-30 feet.

Okmulgee and Muskogee Counties

McKay and others' No. 4 Asbury, SE SE NW Section 31-16-15, Muskogee County, was shut down with a hole full of water from Wilcox sand at 1,769-76 feet.

D. M. Logan was rigged up to start No. 4 Pigeon, NE SE NE Section 31-15-13, Okmulgee County; Aggas Drilling Co. had machine in for No. 1-A McKinney, SW NW SW Section 16-15-14; E. Price was drilling at 325 feet in No. 1-A Osborne, CEL SE SE Section 19-15-14.

Dodge Brothers have a 60-bbl. completion in No. 4 Herrod, a twin, NE SE SE Section 17-15-14, in Salt Sand at 789-839 feet which had been given a 120-quart shot, and were rigged up on No. 5 Herrod, SE NE SE Section 17-15-14.

Phillip Doyle's No. 1 Coleman, NW NE SE Section 33-15-17, Muskogee County, had a 1,000,000-foot gas production at 1,133-45 feet, but continued drilling and 8-inch casing was set at 1,445 feet.

Jordan & Harmon were rigging up No. 3 Checotah, SE NE NE Section 35-14-12, Okmulgee County. J. M. Foltz is deepening No. 1 McIntosh, NE cor. SE Section 17-14-17, from its old total depth of 1,350 feet. Hawkins & Greenfield spudded No. 1-A Smith, C NE SW Section 19-13-13, Okmulgee County. Thompson and others' No. 3 Douglas, CNL NW SE Section 22-12-13, is a machine.

In McIntosh County Harmon Brothers were drilling at 500 feet in No. 2 Smith, NE SE NE Section 21-12-14. King and others have machine in for No. 4 Anderson, NE SW NE Section 28-12-14. Lindy Oil Co.'s No. 3 Gooden, C SE SE Section 28-12-14, was dry in sand at 635-56 feet and was abandoned, but the owners had machine in for No. 4 Gooden, NW SW SE Section 28. W. C. McAdoo was drilling at 300 feet in No. 1 Broadnox, NE SW NW Section 31-12-14.

Okfuskee County

C. H. Cameron has rotary rig up for No. 3 Hennehuckee, NE NW NE Section 17-12-7, Okfuskee County. Champlin Refining Co. was preparing to deepen No. 8 Guy, SE NW SW Section 22-11-11, from 2,650 feet. Hovel, Keaton & Gold were rigged up to start No. 2 Kikowski, SW NW NE Section 26-11-11.

Mid-Continent Petroleum Corp.'s No. 3 Dindy, SW SW NE Section 31-11-11, was completed as an 8,000,000-foot gasser producing from Hunton lime at 3,607-38 feet.

Wells and others abandoned No. 1-B Johnson, NW SE NW Section 34-11-11, at 1,787 feet. Sand at 1,780-85 feet yielded 45 bbls. of oil on the swab but the oil was drowned out by water.

In the Crescent Field in Logan County Mid-Continent Petroleum Corp. was drilling at 200 feet in No. 2 Campbell, C SE NE Section 33-17-4w. The Texas Co. was digging cellar No. 3 Denny, C NE NE

Wildcat Operations in Oklahoma

Week Ending November 10

NORTHERN OKLAHOMA

ALFALFA COUNTY

Acre et al's No. 1 Acre, C SW NE Sec. 14-24-11w.
T.D. 6,460 ft.; lost tools and S.D.

BECKHAM COUNTY

Fred Coogan et al's No. 1 Shelton, SW cor. Sec. 33-10-25w.
Rigged up and S.D.

CADDO COUNTY

H. W. Lee et al's No. 1 Stacey Ferrell, SW NE NE Sec. 3-16-13w; (2,000-ft. test).
U.R. 12-in. csg. to 842 ft.

Denver Prod. & Ref. Co.'s No. 1 Noe, NW SW SW Sec. 34-10-10w.
T.D. 11,230 ft.; trying to land 6-in. parted csg. at 4,000 ft.

CLEVELAND COUNTY

Anderson & Kerr et al's No. 1 Wilson, NW SE Sec. 27-10-1e.
Shot with 90 qts. at 5,680-5,740 ft.; 5,000 ft. of S.W.; abd.

Mid-Continent Pet. Corp. et al's No. 1 Collett, C E½ NE SW Sec. 35-10-1w.
T.D. 6,443 ft.; fishing for drill pipe.

COAL COUNTY

Moore & Deaner's No. 1 Edward, NW NE SE Sec. 27-2-8.
T.D. 7,102 ft.; drlg. out cmt.

J. D. Petty Oil Co.'s No. 1 McMillan, SW NW NE Sec. 16-1s-8.
Drlg. 1,000 ft.

GARFIELD COUNTY

Ross Cummings et al's No. 1 Gage, SE NW Sec. 27-22-3w.
Spudded and S.D.

GARVIN COUNTY

William H. Atkinson et al's No. 1 Pharoah, NW cor. Sec. 15-3-2w.
Top Wilcox 6,190 ft.; drlg. 6,202 ft.

National Prod. Co.'s No. 1 Littrell, NE cor. Sec. 31-2n-3w.
Drlg. 690 ft.

GRANT COUNTY

Helmerich & Payne's No. 1 Crouse, C NE SW Sec. 29-25-8w.
Skidded rig 60 ft. N on acct. of hopeless fishing job.

Sultan Oil Corp.'s No. 1 Patton, SW SE Sec. 19-29-3w.
Cored sandy dolomite 4,966-71 ft.; salty.

HARPER COUNTY

Sinclair Prairie Oil Co.'s No. 1 Neff, NW SE Sec. 21-26-24w.
Top of Mississippi lime 7,030 ft.; drlg. in lime at 7,390 ft.

HUGHES COUNTY

Evans & Morris' No. 1 Day, NW NW SW Sec. 30-6-10 (700-ft. test).
Spudded.

Freeman et al's No. 1 Kite, NW NW NE Sec. 8-6-10.
Machine.

Turner et al's No. 1 Williams, SW cor. Sec. 35-7-10.
Rig.

KAY COUNTY

Bay Oil Co.'s No. 1 Holden, SW SW SE Sec. 14-28-3.
Drlg. 480 ft.

Carter Oil Co.'s No. 1 Fowler, C NE Sec. 12-27-1e.
Drlg. 500 ft.

S. R. McCorkle et al's No. 1 Smith, SW cor. Sec. 6-26-4.
Moving in material.

KINGFISHER COUNTY

Jadeka Dev. Co.'s No. 1 Frakes, C SW NE SW Sec. 16-15-6w.
T.D. 7,612 ft.; drill pipe pulled; S.D.

LEFLORE COUNTY

East Okla. O. & G. Co.'s No. 1 Metcalf, SW cor. Sec. 2-4-26.
T.D. 2,040 ft.; hole caved; S.D.

Murdock et al's No. 1 fee, SW NE SW Sec. 15-5-25e.
T.D. 2,425 ft.; S.D.

LINCOLN COUNTY

Tom Bennett et al's No. 1 Bolby, C SE SW Sec. 27-12-2.
Cored 5,065-81 ft.; will run csg.

R. L. Kemp and Comail Oil Co.'s No. 1 Dooley, NE SW Sec. 20-17-6.
Drlg. 469 ft.

Derrickson and Reserve Pet. Co.'s No. 1 Law, SE SW NE Sec. 25-14-3.
Rig on ground.

M. Murray and Ralph Day's No. 1 Rittenhouse, NW NW NE Sec. 26-14-6.
Sylvan 4,143 ft.; drlg. 4,215 ft.

Sinclair Prairie Oil Co.'s No. 1 Hoyt, NW SW NE Sec. 5-14-3.
Drlg. 2,360 ft.

Sinclair Prairie Oil Co.'s No. 1 Boland, SW cor. Sec. 25-12-3.
D.D.; cored 5,468-70 ft.; swbd. 26 bbls. oil and 41 bbls. oil in 16 hrs.

LOGAN COUNTY

W. N. Anthony's No. 1 Fruin, SE SW Sec. 4-16-1.
Wilcox 5,265-85 ft.; P.B. to 5,181 ft.; will shoot Misener sand.

Gypsy Oil Co. and Sinclair Prairie O. & G. Co.'s No. 1 Manning, C NW NW Sec. 8-17-4w.
T.D. 6,411 ft.; will test Layton sand.

(Continued on Page 159)

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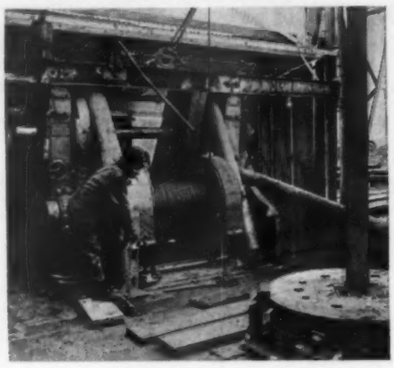

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CONTINENTAL NATIONAL BANK

OF FORT WORTH

SE Section 33-17-4w, and Gypsy Oil Co. and Carter Oil Co. were digging cellar for No. 3 Knowles, SW SW NW Section 34-17-4w. Eason Oil Co. has rig up for No. 4 Katscher, SW NW SW Section 34-17-4w.

Eason Oil Co.'s No. 2 Katscher, No. 1, C NW NE SW Section 34-17-4w, swabbed 174 bbls. in a 24-hour test and later flowed 8 bbls. in 24 hours. This test had Wilcox sand at 6,291-6,319 feet and was shot with 120 quarts.

Sinclair Prairie Oil Co. and others were moving in material for No. 1 School land, SE cor. Section 36-17-1w, in the Langston area, but a wildcat.

Oklahoma County

Stanolind Oil Co. and Amerada Petroleum Corp.'s No. 1 Suenram, NE cor. Section 6-13-3w, flowed 1,230 bbls. of oil in eight hours through an approximately three-quarter-inch choke.

Charles E. Carter and others were moving tools at No. 1 Brobins, NW NW NE Section 33-13-3w.

In the Oklahoma City Field Phillips Petroleum Co. completed No. 3 Wallace, 984 feet north and 1,159 feet west of SE cor. Section 22-11-3w. It flowed 1,414 bbls. in 24 hours from Wilcox sand at 6,495-6,542 feet.

Phillips Petroleum Co. and Shell Petroleum Corp.'s No. 8 Berg, NE NE SE Section 26-11-3w, was given a test of 16½ hours on the gas lift and produced 1,389 bbls. of oil and was then shut in again.

In the Greater Seminole Field

Carter Oil Co.'s No. 1 Welty, C SW NE Section 2-11-8, Keokuk area, Seminole County, took a potential gauge and produced 305 bbls. in 24 hours and was completed. It produces from Hunton lime at 3,910-40 feet.

Carter Oil Co.'s No. 4 Knapp, NW NW SW Section 13-9-6, an old Wilcox sand well plugged back, was completed in Hunton lime at 4,046-76 feet. It made 206 bbls. in 48 hours through tubing.

W. D. Grisso's No. 1-A Kenyon, C NE SE Section 3-8-4, Pottawatomie County, not yet completed, flowed 472 bbls. in a 24-hour test. It has Hunton lime at 4,050-67 feet.

Turman Oil Co.'s No. 1 Hubbard, SW SW NW Section 29-8-4, another well not completed, swabbed and flowed 1,256 bbls. of oil in 48 hours. It has Hunton at 4,277-79 feet.

Elbar Oil Co. and others' No. 3 Wyatt, NE NE NW Section 10-7-4, South St. Louis Field, has sand at 3,466-85 feet and swabbed and flowed 450 bbls. of oil in 24 hours.

Seminole Pipe & Supply Co.'s No. 1 Douglas, SW SE NW Section 10-7-4, was still not completed. It swabbed 40 bbls. in a 24-hour test in the past week.

L. M. Russell's No. 1 White, NE NE NW Section 18-7-4, after a second acid treatment in Hunton lime at 3,818-74 feet, swabbed 100 bbls. in 24 hours.

In the rich Wilcox sand zone in the Fish Pool, Slick Urschel, Inc.'s No. 2 Reed, SW NE SE Section 31-7-8, flowed 1,115 bbls. of oil in 11½ hours from Wilcox sand at 4,211-17 feet.

The Mid-Continent Petroleum Corp.'s No. 2 Harjo, NW SE SE Section 31-7-8, flowed 1,030 bbls. of oil in 24 hours from Viola lime at 4,163-79 feet. It continued drilling and found Simpson at 4,190 feet and dolomite at 4,239 feet and was drilling at 4,280 feet.

Bishop Oil Co.'s No. 1 Zoller, CEL NE NW NE Section 6-6-5, recently completed, was drilled deeper to Wilcox sand at 4,192-98 feet and swabbed 450 bbls. in 15 hours.

New work in the Greater Seminole area included Amerada Petroleum Corp. and Stanolind Oil & Gas Co.'s No. 2 Black, SW SW NE Section 27-8-8, Seminole County, rigging up rotary; Newt Barrett and others' No. 1 Brandenberg, NE SE SE Section 3-7-4, location; Dingee and others' No. 1 Williams, NE NW Section 14-7-4, location; Magnolia Petroleum Co.'s No. 4 Reed, SW SW SE Section 30-7-8, location; Empire Oil & Refining Co.'s No. 3 Myers, SW NE NE Section 31-7-8, location; Texas Co.'s No. 1 Reed, NE NW NE Section 6-6-8, rig.

Cleveland County

Anderson & Kerr and others' No. 1 Wilson, NW NW SE Section 27-10-1e, Cleveland County, a wildcat, was shot with 90 quarts in Wilcox sand at 5,680-5,740 feet, and the hole filled 5,000 feet with salt water. The test was abandoned. The Mid-Continent Petroleum Corp.'s test No. 1 Collett, C E half NE SW Section 35-10-1w, was at a total depth of 6,443 feet, fishing for drill pipe. Top of Hunton lime was found at 6,164 feet.

Pontotoc County

Magnolia Petroleum Co. completed No. 1 Craddock, SE cor. Section 24-2-6, in the Fitts Pool, Pontotoc County. It was reported last week as having tested 625 bbls. the first 24 hours after an acid treatment at 4,138-4,505 feet.

Stanolind Oil & Gas Co. and others' No. 1 Norris Royalty Co., SE NW SE Section 25-2-6, was completed. It flowed four hours at the rate of 4,896 bbls. a day with gas at the rate of 3,500,000 feet from Simpson pay at 4,100-90 feet and 4,210-43 feet.

Another big one was E. H. Moore and others' No. 1 Woodruff, SW NW SE Section 29-2-7, which flowed four hours at the rate of 5,730 bbls. per day from Simpson pay at 4,030-50 feet and 4,105-25 feet. It was completed.

New locations in the Fitts area included Carter Oil Co.'s No. 4 Craddock, NE SE NE Section 25-2-6; Magnolia Petroleum Co.'s No. 4 Tom Norris, SE SW NE Section 25-2-6; Stanolind Oil &

LEGAL

Call for Bids To Purchase Royalty Oil Accruing to the United States from the Salt Creek, Wyoming, Oil Field. Pursuant to the provisions of Section 36 of the act approved February 25, 1920 (41 Stat. 437), sealed proposals, in duplicate, will be received in the office of the Secretary of the Interior, Washington, D. C., on or before noon December 10, 1934, from responsible bidders for the purchase for a period beginning January 1, 1935, of all royalty oil accruing to the United States from Government lands in the Salt Creek, Wyoming, oil field. The Government royalty oil from the Salt Creek field amounts to about 12.6 per cent of the production of the field and for the calendar year 1932 amounted to 1,001,387 barrels, for 1933 to 885,085 barrels, for the first eight months of 1934 to 546,743 barrels. The average gravity in all years was in the range from 36.0 to 36.9 degrees A.P.I. Additional information may be obtained from the Director, Geological Survey, Department of the Interior, Washington, D. C., or the Supervisor, U. S. Geological Survey, Casper, Wyoming. Bids are invited on three separate items as follows: Item 1. Royalty oil for a period of one year beginning January 1, 1935, and ending December 31, 1935. Item 2. Royalty oil for a period of two years beginning January 1, 1935, and ending December 31, 1936. Item 3. Royalty oil for a period of three years beginning January 1, 1935, and ending December 31, 1937. Bids must be in the following exact form: "For the period beginning January 1, 1935, and ending December 31, 193—(name of bidder), offers —— cents per barrel above the highest field price for oil of equal or lower gravity in Oklahoma and Kansas, and/or in Wyoming, whichever is the higher, as published or offered on any basis of volume measurement by any responsible recognized purchaser for crude oil in quantity not less than 2,000 barrels a day." Delivery of royalty oil will be made in the field to the successful bidder or for his account without cost to the Government. Payments for the royalty oil are to be made through the office of the Supervisor, U. S. Geological Survey, Federal Building, Casper, Wyoming, to the order of the Commissioner of the General Land Office on or before the last day of each calendar month following the calendar month in which delivery is made. The volume of royalty oil will be determined by such rule of volume measurement as may be applicable to production of the Salt Creek field under regulation or order of the Secretary of the Interior; and it is proposed that effective January 1, 1935, the volume of production shall be determined by tank measurement as based on 100 per cent capacity tables and shall be computed in terms of barrels of clean oil of 42 U. S. gallons of 231 cubic inches, in conformity with departmental order of August 6, 1932. Each bidder must submit with his bid a bond in the sum of $1,000 or a certified check payable to the order of the Secretary of the Interior in the sum of $1,000 as a guarantee that he will, if successful, promptly execute a satisfactory contract and furnish a bond in the sum of $200,000, conditioned upon full and complete compliance with the terms of the contract. The Secretary of the Interior may accept the offer of the highest bidder and/or bidders and reserves the right to reject all bids whenever within his judgment the interest of the United States demands. Storage facilities are available on Naval Petroleum Reserve No. 3, Wyoming (Teapot), for approximately 1,500,000 barrels of oil. Information in regard thereto may be obtained from the Secretary of the Navy. Sealed bids are to be submitted to the Secretary, Department of the Interior, Washington, D. C., the envelope to be marked plainly "Bid on Salt Creek royalty oil." No bid received after the time herein fixed for submitting bids will be considered. (Signed) T. A. Walters, Acting Secretary of the Interior. October 31, 1934.

Gas Co. and others' No. 2 Norris Royalty Co., SE SW SE Section 25-2-6, and No. 3 Norris Royalty Co., NE SW SE Section 25; E. H. Moore and others' No. 3 Wirrick, SE NE SW Section 29-2-7, and No. 4 Wirrick, NW SW SE Section 29; Stanolind Oil & Gas Co. and others' No. 2 Hardin, NW NW SW Section 30-2-7, and No. 3 Hardin, SW cor. Section 30.

Southern Counties

Johnson & Landell were fishing for liner in No. 1 Johnson, SW cor. Section 26-2n-11w, Comanche County. Six-inch pipe was set at 650 feet, total depth 930 feet. W. A. Baber and others spudded No. 1 Hodges, CSL SW NW Section 31-2n-10w, in Comanche County.

Farlyn Oil Co. completed a 25-bbl. well in No. 25 Seay, 965 feet north and 865 feet west of SE cor. Section 3-7s-5w, Jefferson County, in pay at 1,076-88 feet and 1,092-1,105 feet.

Schermerhorn Oil Co.'s No. 31 fee, C S half NE NW SW Section 5-4s-3w, in the Healdton Pool, Carter County, was completed. It produced 50 bbls. of oil and 30 bbls. of water from a sand series at 1,106-48 feet which had been shot with gelatin.

Heenan & Coe and others completed No. 1 Hefner, SE NE SW Section 13-3s-7w, Stephens County. It was dry and abandoned at 2,100 feet.

Curtis Oil Co.'s No. 6 Dare, NW SE SE Section 2-2s-8w, Stephens County, had sand at 2,106-26 feet, and set 6-inch casing at 2,104 feet. T. H. McCasland made a location for No. 1-B Burk, NW SW SW Section 4-2s-8w. W. J. McAllister was rigging up rotary for No. 1 Nigh, NE cor. SW Section 11-2s-8w. Egleston and others were drilling at 400 feet in No. 1 Wilson, NW SW NW Section 2-2s-5w, all in Stephens County

Skelly Oil Co. had a rig up for No. 3 Moore, SE SE NW Section 17-2s-2w, Carter County.

Wildcat Operations in Oklahoma

(Continued from Page 157)

Helmerich-Payne et al's No. 1 Sturgis, SE NW.
Rigging up rotary.
Sinclair Prairie Oil Co. et al's No. 1 Dunbar, Sec. 25-15-4w.
Drlg. 2,020 ft.
Sinclair Prairie Oil Co. et al's No. 1 School Land, SE cor. Sec. 36-17-1w.
Moving in material.

NOBLE COUNTY

Marathon Oil Co.'s No. 1 Gilbert, NE cor. Sec. 24-22-2.
Bldg. rig.

OKFUSKEE COUNTY

Delton Oil Co.'s No. 1-A Fixico, SE cor. Sec. 7-11-8.
Spudding.

OKLAHOMA COUNTY

R. Carl Larkin's No. 1 Brobine, NW NW NE Sec. 33-13-3w.
Digging cellar.
Springrose Drlg. Co.'s No. 1 Edwards, C SE Sec. 19-11-1.
T.D. 6,540 ft.; 400 ft. drill pipe in hole; S.D.

OSAGE COUNTY

Peters Pet. Co. and Norbla Oil Co.'s No. 1, SW cor. Sec. 15-25-5.
H.F.W. 3,040 ft.

PITTSBURG COUNTY

McAllister Pet. Co. et al's No. 1 Chunn, SE NW Sec. 29-4-14.
Set 12½-in. pipe 249 ft.
P. H. Gray et al's No. 1 Lee, NW SE Sec. 12-5-13.
S.D. 160 ft.
W. E. Halley's No. 1 Drew, NW SW Sec. 21-3-14.
S.D. 190 ft.

PONTOTOC COUNTY

Charles E. Carter et al's No. 1 Wood, NW SW SE Sec. 5-4-3.
Spudded and S.D.
E. M. Blanchard's No. 1 Crabtree, NE SE NE Sec. 27-2-6.
S.D. 2,920 ft.
Boyle et al's No. 1 Newbern, SW NE Sec. 31-5-4.
P.B. to 2,030 ft. and shot; H.F.W.; S.D.
Dandridge et al's No. 1 Stafford, NW cor. Sec. 5-1-6e.
T.D. 740 ft.; S.D.
Dixie Oil Co., Inc.'s No. 1 Graham, SW SE SW Sec. 13-1-7.
Rig.
Gillette & Kroeger's No. 1 Robbins, NE SE Sec. 31-1-4.
T.D. 760 ft.; S.D.
Gillette & Kroeger's No. 1 Duver, NW SE Sec. 36-1n-6e.
Drlg. 784 ft.
J. D. Sledge and Jack Lynch's No. 1-A (twin) Thompson, SW NE SW Sec. 1-1n-7e.
Hunton lime 3,830-48 ft.; good oil show.
Southern Oil Corp.'s No. 1 Ladd, C NW NW Sec. 27-3-7.
C.O. 535 ft.

POTTAWATOMIE COUNTY

Blackgold Pet. Co.'s No. 1 Bizzell, C NE NW Sec. 15-7-3.
Spudded.
Moran et al's No. 1 Brinlee, SW SW SE Sec. 27-6-5.
Shot with 50 qts. at 2,663-2,700 ft.; C.O.
W. D. Grisso et al's No. 1-A Kenyon, C NE SE Sec. 3-3-4.
Hunton 4,050-67 ft.; acidized; 472 bbls., pinched in, in 24 hrs.

SEMINOLE COUNTY

Anderson & Kerr et al's No. 1 Baumgartner, NW NW SW Sec. 7-10-8.
Drlg. 2,990 ft.
Harris and Haun's No. 1 Harjo, NE SE NW Sec. 11-6-6 (O.W.P.B.).
P.B. to 2,115 ft.; H.F.W.; S.D.
Mudge Oil Co.'s No. 1 Whitney, SE NW Sec. 9-6-7.
Sand 1,935-36 ft.; swbd. 45 bbls. oil and 45 bbls. of wtr. in 13 hrs.; S.D.
Verser & Clay et al's No. 1 Thomas, NE SE NW Sec. 1-4-6.
T.D. 2,100 ft.; rigging up standard tools.

TEXAS COUNTY (PANHANDLE)

Ben F. Ash et al's No. 1 Guymon Townsite, C NE SE Sec. 30-3n-15e (Cimarron Meridian).
Drlg. 2,120 ft.

WASHITA COUNTY

Anadarko Basin Oil Co.'s No. 1 Wolf, NE SW Sec. 23-9-17w.
Rigged up and S.D.
Okla.-Midwestern Oil Co.'s No. 1 Dock, SW cor. Sec. 21-8-18w.
T.D. 2,430 ft.; lost tools in hole; rig rebuilt; S.D.

SOUTHERN OKLAHOMA

ATOKA COUNTY

Brookshire et al's No. 1 Rowland, NW NE NE Sec. 18-3s-10e.
T.D. 3,709 ft.; drlg. up baller.
J. D. Boukan's No. 1 Howard, NW SW NW Sec. 20-3s-10e.
S.D. 1,135 ft.; machine moved out.
L. A. Fitts' No. 1 Blankenship, NE cor. NW Sec. 19-3s-10e.
T.D. 651 ft.; S.D.
T. C. Ramler et al's No. 1 Roberts, SW SE SW Sec. 6-2s-12e.
S.D. 1,175 ft.

CARTER COUNTY

Daphfine Oil Co.'s No. 1 Hooks, SE NW NW SE Sec. 5-1s-2w.
Drlg. 3,175 ft.

CHOCTAW COUNTY

J. V. Scrivener et al's No. 1 Swink, C NE SE Sec. 29-6s-20e.
S.D. 810 ft.

COMANCHE COUNTY

F. F. Stevens' No. 1 Green, SE SW Sec. 2-1-13w.
T.D. 1,210 ft.; drlg. by tools at 1,165 ft.
Helden & Taylor's No. 3 Crutcher, C NE Sec. 11-1n-12w.
T.D. 863 ft.

JACKSON COUNTY

Burk Royalty Co.'s No. 1 Gore, SE NW SE Sec. 3-1s-20w.
S.D. for wtr. at 1,600 ft.
Gypsy Oil Co.'s No. 1 Stokes, SE NW SW Sec. 11-1-20w.
Lime 1,709-11 ft.; T.D. 1,723 ft.; S.D.
Gypsy Oil Co.'s No. 1-A (Twin) Kelly, NE cor. Sec. 10-1n-20w.
Shot with 70 qts. at 1,150-70 ft.; 300,000 ft. gas; 140 lbs. pressure.
Gypsy Oil Co.'s No. 1-B Kelly (twin), 330 ft. S and 330 ft. W, SE cor. Sec. 10-1n-20w.
Bldg. rig.
Ben Russell et al's No. 1 Unknown, NW SE Sec. 30-1-22w.
Drlg. 3,980 ft.

JEFFERSON COUNTY

Geo. Pace et al's No. 1 Jack, NE NW NW Sec. 10-4s-4w.
Drlg. 2,963 ft.
H. F. Young et al's No. 1 Boulden, SE SW SW Sec. 1-7-4w.
Location.

JOHNSTON COUNTY

Gled Oil Co. et al's No. 1 Ferguson, SW SE NE Sec. 26-2s-8.
T.D. 1,803 ft.; fishing for tools.

MARSHALL COUNTY

Paul Robb's No. 1 Vittetoe, C NE SE Sec. 11-5s-4e.
T.D. 4,938 ft.; recovered drill pipe.

MURRAY COUNTY

T. E. Revell et al's No. 1 Wolfe, NE cor. Sec. 18-1-2.
Sand 2,658-70 ft.; show of oil; T.D. 2,710 ft.; S.D.
C. P. Williams et al's No. 1 Singleterry, SE SW NW Sec. 25-2s-3e.
Drlg. 525 ft.

STEPHENS COUNTY

Wm. Angle's No. 1 Johnson, NE cor. SE Sec. 17-1n-8w.
Set 6-in. 2,210 ft.; sand 2,214-18 ft.; T.D.
Carter Oil Co.'s No. 1 McCasland, C NW NW SW Sec. 22-1s-4w.
T.D. 5,317 ft.; in shale; will test oil sand at 4,840 ft.
Dixie Oil Co., Inc.'s No. 1 Graham, SW SE SW Sec. 13-1n-7w.
Rig.
Heenan & Coe's No. 1 Hefner, SE NE SW Sec. 13-3s-7w.
T.D. 2,100 ft.; dry and abd.
J. W. Madison's No. 1 Tussey, SW SE NW Sec. 24-1n-4w.
Rig down, drill pipe in hole; S.D. 3,220 ft.

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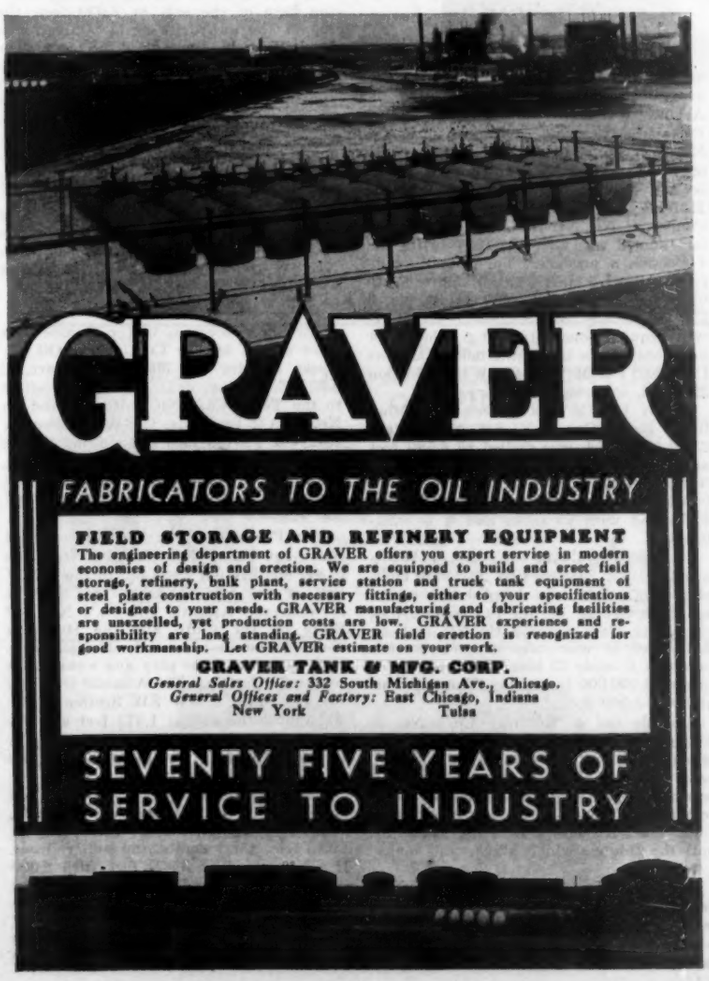

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Important Wildcat Started Northwest of Lea Pool; Utah Deep Test Gauges 20,000,000 Feet Gas

By TOLBERT R. INGRAM
Staff Correspondent, Rocky Mountain Area

DENVER, Colo., Nov. 12.—Two locations were abandoned and two new locations were staked in the Cooper Pool in New Mexico, and Gypsy Oil Co. has a near completion in its No. 1 Cooper, which made 12½ bbls. in one hour on a drill stem test. Two new locations were reported in the Eunice Pool and in the Hobbs Pool Shell Petroleum Corp.'s No. 1 Sanger gauged 7,216 bbls. after being treated twice. Maljamar Oil & Gas Co.'s No. 4 Baish, in the Maljamar area, is flowing by heads and apparently has opened a new pay. The Texas Co. is starting an important wildcat northwest of the Lea Pool.

There were no completions or new locations in Colorado.

Rumors of pending deals in Wyoming were widely discussed. The Ohio Oil Co.'s No. 2 Byron Union on the Byron Dome in Big Horn County, is estimated good for 500 bbls. a day. Another test is being started on that structure by the Ohio company. One new location was reported in Fremont County, a wildcat on Sheep Creek.

Drilling in Cut Bank in Montana is slowing down and only one well was completed and no new locations were made.

Mountain Fuel Supply Co.'s deep test in Daggett County, Utah, gauged 20,000,000 feet of gas a day in the first Dakota and is drilling deeper.

NEW MEXICO

Cooper Area

Two locations were abandoned and two new locations were staked in the Cooper area. The abandoned locations are the Atlantic Oil Producing Co. and Kirby Petroleum Co.'s No. 1 Woolworth, C SW NE Section 26-24-36, half a mile south of the Humble's No. 1 Thomas, which is not showing up favorably, and the Humble Oil & Refining Co.'s No. 2 Cooper, C NE NE Section 23-24-36. The last named was an east offset to its No. 1 Cooper, a producer. The Humble company staked a new location for a north offset to its No. 1 Cooper in its No. 3 Cooper, C SW SE Section 14-24-36. It will require some offsetting. The other new location is the Stanolind Oil & Gas Co.'s No. 3-A Meyers, C SW NE Section 22-24-36, in proven territory.

Gypsy Oil Co. has a near completion in its No. 1 Cooper, C SW NE Section 23-24-36, which was drilled to 3,580 feet and given a drill stem test at 3,500-80 feet in which it made 12½ bbls. in one hour. The 7-inch was then cemented at 3,475 feet with 75 sacks and it is waiting.

Phillips Petroleum Co.'s No. 7 Woolworth, C SE SW Section 23-24-36, completion of which was delayed two weeks ago by a fishing job for the tubing, was completed after running the 2½-inch to 3,495 feet. It was given a one-hour test in which it made 35 bbls. with gas at the rate of 3,100,000 feet a day. The pay was at 3,475-3,500 feet.

Humble Oil & Refining Co.'s No. 1 Thomas, C SW SE Section 23-24-36, an outside well on the eastern side of the pool which so far has proved a disappointment, has plugged back from 3,586 feet to 3,470 feet. Old total depth was 3,602 feet. An effort is being made to pull the tubing, which stuck, and make a test.

Humble's No. 1 Coats, C NW NE Section 10-24-36, which was on fire for several days at 3,355 feet, total depth, is trying to pull drill stem. If the fishing job is not successful in a few days the hole may be abandoned and rig skidded to new location. It gauged 38,000,000 feet of gas and while on fire the hole began to crater. The Phillips Petroleum Co.'s No. 9 Woolworth, C NW NE Section 27-24-36, has cellar completed, and the General Crude Oil Co.'s No. 3 Meyers, C NW SE Section 22-24-36, set the 15-inch at 222 feet with 280 sacks and is waiting. The Gypsy Oil Co.'s No. 2 Cooper, C NW SE Section 23-24-36, has cellar and pits completed, and the Texas Co.'s No. 1 Everett, C SE NW Section 35-24-36, set the 12½-inch at 150 feet with 100 sacks and is drilling at 575 feet in red beds. The Amerada Petroleum Corp.'s No. 1 Everett, C NE NW Section 35-24-36, set the 12½-inch on bottom at 210 feet, in the red beds, with 250 sacks and is waiting. The Continental Oil Co.'s No. 1 Gates, C NE NW Section 23-24-36, is drilling at 3,450 feet in lime, and the Stanolind Oil & Gas Co.'s No. 2-A Meyers, C NE NE Section 22-24-36, is drilling at 3,262 feet in brown lime. The Empire Gas & Fuel Co.'s No. 1 Everett, C NE SW Section 35-24-36, has rig up.

Jal Area

The Continental Oil Co.'s No. 12-A-2 Wells, C NW NE Section 12-25-36, set the 9⅝-inch at 1,668 feet with 500 sacks and is drilling at 1,950 feet in salt and anhydrite. The Texas Co.'s No. 2-B Shepard, NW NE SE Section 6-26-37, found the base of the salt at 2,630 feet, the top of the anhydrite at 2,650 feet, and is drilling in lime at 2,788 feet. The elevation is 2,971 feet. The Repollo Oil Co.'s No. 1 Gloyd, SW cor. SE Section 12-25-36, is coring in lime at 3,325 feet and picked up the first saturation at 3,298 feet. The 7-inch was cemented at 3,296 feet with 325 sacks. E. B. Guess' No. 1-B Justis, SW NW NW Section 20-25-37, cemented the 12½-inch on bottom at 630 feet and shut down for rig repairs. The 15-inch is at 80 feet. The Empire Gas & Fuel Co.'s No. 1 Dyer, NE SW SE Section 31-25-37, is rigging up rotary.

Eunice Area

Two new locations in the Eunice area were staked by the Continental Oil Co. These are its No. 30-A-1 Lockhart, C SE NE Section 30-21-36, a north offset to the Texas Co.'s No. 1 Rector, and its No. 18-A-2 Lockhart, C SW SE Section 18-21-36. Last named is an offset on the west of the Continental's No. 1 Lockhart, in the SE cor. Section 18, which was completed early in 1931 for 422 bbls. initial at 3,990 feet.

The Peerless Oil & Gas Co.'s No. 1 State has changed its location from the C SE NE Section 29-21-36, to the C NW SW of the same section. This puts it between the Atlantic Oil Co.'s No. 1-F State on the south and the Humble's No. 1 State on the north. The old location was east of the play and would have required offsetting. The Atlantic Oil Co.'s No. 1-F State, C SW SW Section 29-21-36, topped the salt at 1,473 feet and the anhydrite at 1,485 feet and is drilling in salt at 1,653 feet. The elevation is 3,808 feet.

The Continental Oil Co.'s No. 17-A-4 Meyers, C NE SW Section 17-21-36, swabbed at the rate of 50 bbls. daily at 3,997 feet, total depth, and will re-treat. It was treated at 3,950 feet with 2,000 gallons of acid and then was deepened after showing only a scum of oil. Same company's No. 1-B-9 Meyers, C NE SW Section 9-21-36, has rig up. The Shell Petroleum Corp.'s No. 1 State-Endura, C SE NE Section 12-21-35, is drilling at 556 feet in red beds. The Texas Co.'s No. 2 Rector, C SE SE Section 30-21-36, is drilling at 2,130 feet in salt. The Gypsy Oil Co.'s No. 2 Bell-Ramsey, C SW NW Section 9-21-36, is drilling at 3,750 feet in lime, and its No. 2 Bell-State, C SE SE Section 8-21-36, has cellar and pits completed. The Humble Oil & Refining Co.'s No. 1-B State, C SW NW Section 29-21-36, is coring in lime at 3,830 feet. The Skelly Oil Co.'s No. 1 Coleman, C NW NW Section 17-21-36, is drilling at 3,635 feet in lime, and the Tide Water Oil Co.'s No. 4 Coleman, C SE NE Section 17-21-36, is drilling at 1,415 feet in salt.

Hobbs Area

The Shell Petroleum Corp.'s No. 1 Sanger, SW cor. Section 27-18-38, on the northeastern edge of the Hobbs Pool, which was reported a completion three weeks ago, gauged 7,216 bbls. in 24 hours at 4,229 feet, total depth, after being treated twice with acid. It was first treated with 1,000 gallons at 4,118-52 feet and then with 2,000 gallons at 4,118-4,229 feet. This is one of the wells reported to have encountered a second deep pay in that part of the field. The Oil Well Drilling Co. and others' No. 1 Grimes, SW NE SE Section 20-18-38, cemented the 7-inch on bottom at 4,115 feet with 50 sacks.

The Gypsy Oil Co.'s No. 4 East Grimes, C NE NE Section 33-18-38, on the east side and a west offset to the Stanolind Oil & Gas Co.'s No. 8 Turner, made 3,300 bbls. initial with 4,592,000 feet of gas at 4,117 feet, total depth. The pay was at 3,970-4,117 feet.

Maljamar Area

Considerable interest was manifested this week in the Maljamar Oil & Gas Co.'s No. 4 Baish, NE SE NE Section 21-17-32, in the Maljamar area in western Lea County. It apparently has opened up a new pay in the pool and gives indications that other wells previously completed are on the edge of the structure. No. 4 Baish encountered a flow of gas at 2,330 feet which blew the tools up the hole and broke the line when they fell back. At that time the well was estimated good for 70 bbls. When the fishing job was cleaned up the well made 8 or 10 heads in a few hours along with 1,000,000 feet of gas a day. The operators have made no estimate on its capacity, but are preparing to run the 10-inch and make a test. The location is about 1,300 feet to the south of the discovery well, No. 1 Baish, NE cor. Section 21, which was completed in 1926 for 125 bbls. per day initial at 4,155 feet. This well and others in the vicinity had only small showings at the depth at which No. 4 encountered a pay. No. 4 is running higher than the discovery well and this gives rise to the theory that the discovery well was near the north edge and that better wells will be found to the south. In accordance with this theory the company will go one-fourth of a mile to the south of No. 4 and drill No. 5.

Lea Area

The Texas Co. has released a location for an important wildcat in its No. 1 Moore, C NW SE Section 21-20-32, to the northwest of the Lea Pool. It is 2½ miles southeast of No. 1 Humphreys, NE cor. SW Section 18-20-32, which the Texas Co. drilled to 3,105 feet in 1929 and abandoned, and 1½ miles to the south of the Western Drilling Co.'s No. 1 State, SE NE NE Section 16-20-32, abandoned at 4,005 feet in 1931. Also, it is about a mile north of a dry hole drilled by the Empire Gas & Fuel Co. in 1929 in its No. 1 Martin, SW cor. NE Section 28-20-32, which was abandoned at 3,828 feet.

The Texas Co.'s No. 4-A Lynch, C SE NE Section 34-20-34, is drilling at 1,940 feet in salt and red rock, and its No. 1 Elliott, C NE NE Section 22-20-34, is drilling at 1,630 feet in anhydrite. Same company's No. 1 Swearingin, C NE SW Section 8-20-34, cemented the 12½-inch at 312 feet and is drilling at 480 feet.

Valencia County

Corrected locations of two new operations on the Tome grant, both of which are rigged and ready to spud, are as follows: The Ringle Development Co.'s No. 1 Tome grant, C SE SE Section 20-6n-3e, and the same company's No. 2 Tome grant, C NE SE Section 20-6n-3e. The first named will start in a 20-inch hole to test the Pennsylvanian and the other will be a shallow test to the Dakota.

Western Natural Resources Corp., Inc.'s No. 2 San Clement grant, SW cor. NE Section 5-6n-1e, is drilling at 5,976 feet.

Santa Fe County

The Holmberg Interests' No. 1 Cantwell, NW cor. Section 5-10n-9e, near Stanley, is drilling at 750 feet in hard black lime, and Elmer Fisher's No. 1 Hill, Section 6-10n-7e, Barton district, is drilling at 2,260 feet in hard gray sandy lime.

McKinley County

The Royer Oil Co. of California, which has a number of producing wells in Orange County in that State, has closed a deal to drill several wells on the Walker Dome in McKinley County and a crew of men is now in the field building camp and getting rig ready for the first well which will be drilled in the C NW SW Section 13-15-10w. It will be on the Santa Fe Railroad land and an offset to a test drilled by the Midwest Refining Co. in 1923. The structure then was known as Ambrosia Lake Dome. The old Midwest well was drilled near the center quarter corner on the west side of Section 13 and had a good show of oil and gas at 963-70 feet. It had another show of oil with water at 1,376-82 feet and was abandoned in the McElmo at 1,451 feet. There is good geology on the structure. Roy G. Barton, of Clovis, N. Mex., was active in bringing the structure to the attention of the California men.

COLORADO

In the election last Tuesday Colorado voted the imposition of chain store taxes ranging from $2 a year for single independent stores to $300 each for stores in chains of more than 24 stores. Filling stations come within the provisions of the act. The vote was 132,160 for and 100,350 against. The oil companies did not appear in the campaign against the measure and the fight was made principally by the grocery chain stores. It is probable that the measure will be subject to litigation.

A constitutional amendment limiting the expenditure of revenues from motor fuels to public highway purposes was adopted by a vote of 103,005 for to 95,755 against.

A constitutional amendment limiting gasoline taxes to 3 cents a gallon, except by a vote of the people through initiated or referred measures and prohibiting

municipalities from levying such taxes was defeated by 59,138 for to 128,181 against. This measure was backed by the oil companies.

There were no completions or new locations in Colorado the past week.

Archuleta County

The Navajo Oil Co.'s No. 1 Crowley, SW cor. NE Section 11-32-1e, Chromo district, is running the 8¼-inch to bottom at 475 feet, and the Oil City Petroleum Co.'s No. 2-X Garnett, Lot 3, SW Section 25-33-1e, Price district, is underreaming the 8¼-inch to bottom at 710 feet.

Las Animas County

The Mountain States Oil Corp.'s No. 1 Nikola, C NE SE Section 10-34-62, Garcia district, which has been idle at 1,740 feet on account of water shortage, is installing Franklin engine.

Prowers County

The Trojan Oil & Gas Co.'s No. 1 Lotus Oil, NW NE NE Section 15-23-46, Lamar district, is drilling at 4,019 feet, mostly in lime formation, and had a show of oil and gas in lime at 3,954-61 feet.

Park County

The South Park Oil Co.'s No. 1 State, SE cor. SW Section 16-11-75, Hartsel district, lowered the 12½-inch to 400 feet to shut off a little water in a streak of sand. Total depth is 420 feet.

Routt County

The Texas Co.'s No. 8 Quaintance-Hocking, NE SW NE Section 18-6n-86, Tow Creek, is shut down at 3,590 feet and does not look promising.

Moffat County

The Stanolind Oil & Gas Co.'s No. 14-8D Parkinson, NE SW Section 22-4n-92, Iles Dome, is drilling at 3,002 feet in green shale. It topped the Dakota at 2,672 feet.

Boulder County

Leslie R. Steele's No. 1 Cole, NW cor. NE Section 33-1n-70, Parallel Dome, is drilling at 3,150 feet. Objective is expected at around 3,400 feet.

WYOMING

Reports have been current in Denver and Casper that negotiations are pending between the Ohio Oil Co. and the Consolidated Oil Corp. for sale by the former to the latter of its 82 stripper wells in Salt Creek, with gathering lines, tank farm and equipment. While there is no confirmation of the rumors, and it seldom is the policy of the Ohio company to sell production, it is generally believed there is some foundation to the reports. The Illinois Pipe Line Co., a subsidiary of the Ohio company, took up its Salt Creek-Ilco pipe line a year or two ago and since then the Ohio company has been selling its production, amounting to less than 500 bbls. daily, in the open market. The Sinclair interests are in a position to use this crude at the Parco refinery which was acquired the past spring at a receivers' sale. There is a pipe line between the refinery and Casper. The deal is said to involve about $700,000. The Sinclair-Wyoming Oil Co., a Consolidated subsidiary, has been active of late in cleaning out and deepening many of the stripper wells in Salt Creek which it acquired from the Producers & Refiners Corp. Another current rumor is that the Sinclair interests are working on plans to enlarge their marketing facilities in the Rocky Mountain states, particularly in Denver.

The Yale Oil Corp., which operates refineries at Billings and Miles City, in Montana, has purchased the Wyoming Oil & Refining Co.'s skimming plant at Worland, Wyo., including all assets other than drilling equipment. The Wyoming Oil & Refining Co. is drilling two tests in the Big Horn Basin.

The Fern Oil Co., in which Bruce Sullivan is the leading figure, is reported to have plans under way for the erection of a refinery at Thermopolis, Lucerne, or some other point in the district to refine black oil from the Black Mountain Field in Hot Springs County. Last Spring these interests acquired the six producing wells of the Utah Oil Refining Co. at Black Mountain and has been trucking crude to the railroad and shipping to the Midland refinery at Denver in which Sullivan is interested.

Albany County

The California Co.'s No. 1 Holst, NE SE SE Section 13-17-77, Quealy Dome, is reaming at 3,141 feet and total depth is around 3,389 feet. This test, which was located on a seismograph survey, is running around 300 feet higher than tests drilled on the structure several years ago on the basis of surface geology. It is about due to reach the objective Dakota.

Big Horn County

The Ohio Oil Co.'s No. 2 Byron Union, C SE NE Section 22-56-97, Byron Dome, is bottomed at 5,490 feet, in the Tensleep, after plugging back from 5,505 feet, and is rigging up pumping equipment. It is estimated at 500 bbls. a day. The same company is starting another well to the Tensleep in its No. 1 Hoskins, SW cor. Section 14-56-97, for which rig is up. The Taylor Oil Co.'s No. 1 Hoskins, SE SE Section 25-56-97, has recovered drill stem at 5,275 feet and is preparing to plug back to 4,200 feet to straighten, there being a deviation from perpendicular of 17 degrees. Peter Evanoff and others' No. 1 Griffin, Lot 60, Section 4-55-97, Garland Dome, is drilling at 1,650 feet.

The Wyoming Oil & Refining Co.'s No. 1 Evans, NE cor. NW Section 12-49-91, Paintrock structure, is moving in materials. Jerome Drumheller's No. 1 Martin, SW SE NE Section 17-49-91, Manderson district, cemented the 10-inch at 810 feet and is waiting, and J. W. Bales' No. 1 Parker, C SW SW Section 23-49-89, Ziesman Dome, is shut down at 125 feet.

Carbon County

The Ohio Oil Co.'s No. 1 Morris, C NW SE Section 6-20-77, Diamond Dome, is drilling at 3,270 feet, and the same company's No. 1 Kyle, NE SE NE Section 26-21-79, Medicine Bow, joint with the California Co., is building derrick. The Argo Oil Co.'s No. 1 Government, NE cor. SE Section 5-24-87, O'Brien Springs, is drilling at 950 feet. The Sinclair-Wyoming Oil Co.'s No. 4 Wertz, SW cor. SE Section 7-26-89, Wertz Dome, is shut down at 3,528 feet. Earl W. Reeder, Inc.'s No. 1 Union Pacific, C SW SW Section 19-20-83, Overland Dome, is drilling at 5,750 feet, and its No. 1 Whitford, SW SE SE Section 24-20-84, is rigging up rotary.

Converse County

R. J. Dilger and others' No. 1 Government, SE NE SW Section 33-31-72, Poison Lake, is underreaming the 8¼-inch to bottom at 715 feet.

Fremont County

Nelson & Pouppiert's No. 5, SW SE NW Section 27-3n-1w, Pilot Butte, is drilling at 820 feet with a good show of oil. The Monongahela Oil Co.'s No. 1 Wisda, NE SE SE Section 13-28-93, Crook's Garp, is shut down at corrected depth of 2,970 feet.

The Mid-American Oil Co. has made a location for its No. 2 Government, C NE

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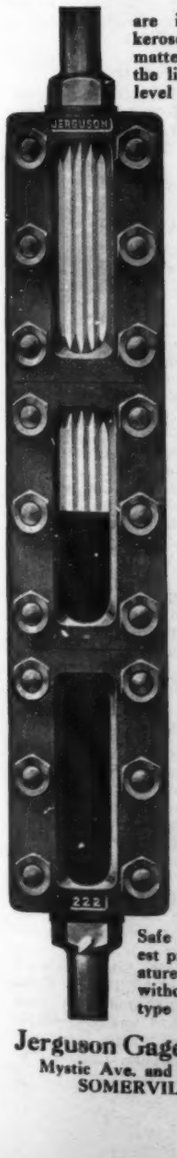

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SW Section 14-28-92, Sheep Creek, and is skidding rig from its No. 1, NE SW Section 4-28-92, 2½ miles to the northwest, which was abandoned at 3,460 feet in a fault.

Hot Springs County

The California Exploration Co.'s No. 1 Government, NE SE NE Section 12-44-97, Waugh Dome, is drilling at 3,280 feet.

Lincoln County

The Senrab Oil Co.'s No. 3 Government, SE NW Section 10-26-113, La Barge district, is fighting cave at 770 feet.

Park County

The Dry Creek Oil Co.'s No. 1 Government, Lot 2, NE SW Section 9-50-100, South Oregon Basin, which last week was reported making better than 10,000,000 feet of gas a day in the second Wall Creek at 1,151 feet, cemented the 5⅞-inch at 1,148 feet, on top of the sand, and is waiting. It gauged 14,000,000 feet a day in the first sand.

Sublet County

The Calmonica Petroleum Co.'s No. 17-3, NW cor. NE Section 17-27-113, La Barge district, is drilling deeper at 2,200 feet after showing for 7 bbls. a day at 2,100 feet.

Sheridan County

The Sheridan Oil Syndicate's No. 1 Allison, SW SE Section 15-55-85, Beaver Creek, is drilling at 2,300 feet.

Sweetwater County

The Sinclair-Wyoming Oil Co.'s No. 76, SW cor. NW Section 11-26-90, Lost Soldier Field, is bottomed at 390 feet and bailing mud to test the first Wall Creek. Same company's No. 46-A, SE cor. Section 3-26-90, is drilling in shale at 1,924 feet. The upper sands at Lost Soldier, including the Wall Creek and Dakota, have produced around 54,000 bbls. to the acre. While this is an unusual record, the lower sands, including the Tensleep, have been developed in only one or two wells. The Wall Creek has had a wonderful yield, but is now considered about exhausted.

Washakie County

The Wyoming Oil & Refining Co., which recently sold its Worland refinery to Yale Oil Corp., is rigging up in its No. 1 Frison, NW SW NW Section 14-48-91, on an unnamed structure alongside of and northwest of Hidden Dome. The Cris Oil Syndicate's No. 1 Government, C SW SW Section 31-48-90, Hidden Dome, is drilling at 960 feet.

Uinta County

The General Petroleum Corp.'s No. 1 Hayes-Union Pacific, SW NW SW Section 29-14-118, Spring Valley, is underreaming the 10-inch to bottom at 950 feet.

MONTANA

Chairman E. B. Coolidge, of the Montana Oil Conservation Board, issued a warning to operators in the Cut Bank Field under date of October 31 that the production in the field is increasing to the danger point where operators may have to take cuts in output or in price, or both, unless they hold down production under the voluntary agreement. Approximately 90 per cent of the operators in the field have agreed to co-operate with the board in its effort to prevent overproduction in the northern Montana fields by refraining from commencing and drilling any new wells except required offsets. The board's records show that since September 5, 17 new wells have been started in the Cut Bank Field and drilling diligently prosecuted although only six of the drillers have requested the board's approval and it has approved only four. The board cites that storage has increased from 45,403 bbls. on June 1 to 175,910 bbls. on September 30. The board states that it will not approve wells 660 feet back from the line as "forced" offsets and points out that no lease has ever been lost on account of failure to drill offsets thus spaced. The board is endeavoring to prevent the proration of fields by voluntary agreement and is urging the 10 per cent of operators who have not signed to co-operate in this effort.

Glacier County

One completion and no new locations were reported in the Cut Bank Field this week. The Montana Power Gas Co.'s No. 1 Gaines, C NW NE Section 6-33-5w, near the town of Cut Bank and an offset, was a small well, estimated at 5 bbls. a day at 2,806 feet, total depth. It had 200 feet of oil at 2,785-94 feet.

C. P. Castle's No. 1 State, SW cor. Section 36-35-6w, which was moved from a center location to 346 feet from the lime, is spudding at 245 feet. The Consolidated Gas Co.'s No. 1 Tribal, E NE NE Section 34-35-6w, set the 10¾-inch at 583 feet with 50 sacks and is drilling at 1,205 feet, and its No. 2 Tribal, NE SE NE Section 34-35-6w, set the 10¾-inch at 585 feet with 50 sacks and is drilling at 590 feet. Fist and others' No. 1 Harper, C NE NE Section 21-34-6w, is drilling at 2,820 feet. The Hannah-Porter Co.'s No. 2 Britton, SW NE NE Section 23-34-6w, is preparing to run the 8¼-inch at 2,826 feet.

The Indian Oil Co.'s No. 1 Reickhoff, SW SE Section 3-34-6w, is drilling at 2,375 feet, and its No. 2 Winkler, W SW SW Section 23-35-6w, is shut down at 2,585 feet to rebuild derrick.

R. C. Jeffries' No. 1 Luckens, C SE SE Section 1-33-6w, is drilling at 2,815 feet.

Lawler & Hoer's No. 2 Harland, C NW NW Section 8-33-5w, is bottomed at 2,843 feet with between 100 and 200 feet of oil in the hole from the Sunburst sand, but the Cut Bank sand at 2,798-2,825 feet was dry. This is more than the usual oil shown in the first sand. The 7-inch is at 2,795 feet. It may make a small well.

Nadeau Brothers' No. 1 Farmers State Bank, C NW NE Section 17-33-5w, is building rig.

The Olive Oil Co.'s No. 2 Winkler, W NW NE Section 35-35-6w, reported a completion last week, swabbed 80 bbls. first 12 hours.

R. C. Tarrant's No. 2 Getty, NW cor. SE Section 2-34-6w, is fishing at 2,500 feet, and his No. 5 Haglund, Jr., C SW NE Section 13-34-5w, is drilling at 2,560 feet. Tarrant's No. 3 Miller, NE NE Section 24-34-6w, is drilling at 1,810 feet, and his No. 1 State, C SE SE Section 36-34-6w, reported a completion last week, is swabbing 100 bbls. a day. The Texas Co.'s No. 1 Kneale, C SW NW Section 14-35-6w, is bailing at 2,880 feet, total depth, and its No. 5 Purdy, NW NW Section 35-35-6w, is standing at 2,877 feet with the 7-inch cemented.

Watson and others' No. 1 Simero, NE SW NE Section 1-33-6w, is drilling at 2,880 feet and does not look very promising.

Big Horn County

The Enterprise Oil Co. and others' No. 2 Lynde, SW cor. SE Section 21-6s-35, Lodge Grass Creek, is drilling out cement at 3,595 feet with the total depth at 3,605 feet.

Carbon County

The Ohio Oil Co.'s No. 14 Maddox, C NW NW Section 10-7s-21, Dry Creek, plugged back to the Dakota at 5,950 feet and is running packer.

Cascade County

Ralph Chamberlain and others' No. 1 Heldman, SE Section 6-19-2w, Crown Butte, is drilling at 2,125 feet in cavey formation.

Petroleum County

Guy Smith and others' No. 2, NE SE SW Section 33-14-26, Flatwillow, is drilling at 1,100 feet.

Stillwater County

The Continental Oil Co.'s No. 1 Orr, SW NW SE Section 18-5s-17, Dean-Ingersoll district, is drilling at 2,818 feet in the Ellis-Sundance.

Teton County

Ned Cheadle and others' No. 1 Balsinger, NE SE NW Section 20-27-5w, West Pondera, had a show of oil and gas at the Madison contact at about 2,480 feet and ran into water in the Madison at 2,554 feet. The well ran low and results indicate two separate folds in the district instead of one.

Toole County

T. P. Kyle's No. 1 Clark, SW cor. SE Section 19-37-1e, Bow and Arrow district, is drilling at 1,050 feet. The 16½-inch is at 40 feet. The Kesun Oil Co.'s No. 1 Stewart, NW NE NE Section 25-35-3w, Kevin-Sunburst Field, is drilling at 1,250 feet.

UTAH

The Mountain Fuel Supply Co.'s No. 2 Murphy, NE NE Section 21-3n-24, Clay Basin, Daggett County, gauged 20,000,000 feet of gas a day in the first bench of the Dakota at 5,652 feet, is coring in shale at 5,766 feet and feeling for the fourth bench of the sand. The second and third benches showed some gas. It topped the Frontier at 5,306 feet and the Dakota at 5,627 feet.

A new operation is the Uintah Gas Co.'s No. 5, NW cor. SW Section 23-5s-22, Ashley Valley district, Uintah County, which is spudding at 100 feet. This company supplies the town of Vernal with gas from the field where it has four wells. The Arrowhead Petroleum Co.'s No. 1-A, SE SW NE Section 1-43-15, Punchbowl district, Washington County, is fishing for bit at 875 feet. The Ramsey Petroleum Co.'s No. 1 Senior, SW NE SW Section 13-26-7e, Emery County, is preparing to run the 5⅞-inch to bottom at 2,960 feet to shut off gas and drill deeper.

CANADIAN GAS LINES

CHATHAM, Ontario, Nov. 12.—Southern Ontario Gas Co., Ltd., of Buffalo has announced the formal filing of plans for a pipe line to cross the River Thames in Kent County. The crossing, between Lots 6 and 7, in Raleigh Township, is part of a 12-mile line to take gas from F. H. Stover & Son's No. 1 well in the Dover Field. Formal application will be made this month to the federal public works department at Ottawa for approval of the plans.

Dominion Natural Gas Co. is laying a mile of 1-inch line in the Tilbury Field, Kent County, to take production from Ladd & Ziegen's No. 1 gasser, recently completed on the Guy Mifflin farm, Lot 7, Concession 14, Tilbury East Township.

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By Charles K. Francis, Ph. D., Technical Editor

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Those connected with the refining of crude petroleum, the manufacture of natural gasoline and closely allied industries are invited to submit their problems to Dr. C. K. Francis, technical editor. The department was created for the purpose of aiding managers, superintendents, engineers, chemists and all those engaged in the various phases of plant operation; also those connected with marketing and utilization of petroleum products.

Questions should be submitted in as much detail as possible.

Inquiries must be signed but only the given initials will be printed. The source of the question is considered to be confidential.

Questions requiring a discussion of patents, the use of intricate formulas, extended computations, or cost estimates cannot be considered.

When the matter is of general interest the reply will be published within a reasonable time.

Corrosive Acids Formed From Burning Gasoline

We should like to have an explanation of what chemical substances of a corrosive character are produced from the combustion of the gasoline in the normal automobile engine? Can such substances be strong enough to seriously corrode the engine?—R. W. B.

It is commonly thought that the sulphur in gasoline is alone responsible for the formation of substances that have a tendency to cause corrosion of the gasoline engine, but when a study is made of the chemical changes that are possible because of the decomposition of the fuel and the series of chemical reactions encouraged by the introduction of moisture and air, it appears there may be other factors that have been overlooked.

So much attention had been directed to sulphur, which is present in every crude oil known, by the experts of the metal industries that it was reasonable for the petroleum chemists to make very close inspections for the quantity of this element that might be contained in the gasoline made for motor fuel. So much study has been devoted to this subject that now the maximum quantity of sulphur that may be present in gasoline is mentioned in the Federal specifications and is also regulated in many of the States. Sulphur produces both oxides and sulphides, that are corrosive, and these are changed into strong acids in the presence of moisture and air.

All ordinary combustion, even of the purest of substances such as sugar or alcohol, produces carbonic acid gas. This forms, with water, carbonic acid; all students of corrosion agree that this will cause corrosion of metals, especially iron and steel. However, when ordinary fuels are burned there are additional substances to combine with the products of combustion and cause trouble. When gasoline is being consumed in the cylinder heads of the engine, air containing oxygen, nitrogen, and moisture must be present. These unite with the carbon and hydrogen of the gasoline to form various products.

The products that have been recognized as corrosive compounds formed from the combustion of gasoline include: Nitric acid, organic acids, sulphur acids, and carbonic acid. A report of the Institution of Automobile research committee, as given in the Petroleum Times, August 11, 1934, page 161, and August 18, page 187, gives the details of experiments with these to demonstrate the extent of the corrosion.

The formation of nitric acid is explained as follows: Oxygen and nitrogen may combine during the explosion to form nitric oxide, further oxidation producing nitrogen peroxide which in the presence of water forms nitric acid. When checking this an "atmosphere" free from nitrogen, a mixture of oxygen and carbon dioxide, was used. In this case the nitrogen-free atmosphere produced the greater wear; probably due to the excess of carbon dioxide.

Experiments with carbon dioxide were made under several different conditions and in each it was demonstrated that the carbon dioxide in the presence of water was a decided corrosive agent. The corrosive action of carbon dioxide is high at low temperatures.

The sulphur in the form of sulphuric acid was found to be a relatively unimportant source of serious corrosion when the first grade gasolines were used, but it was suggested that the fuels with high sulphur percentages should definitely be avoided.

When alcohol blends are used as a motor fuel organic acids are to be expected to be produced. Tests made with a gasoline containing 17 per cent alcohol showed that the cylinder wear was increased 80 per cent and the top piston wear by 100 per cent over the gasoline wear.

New Specifications for Fuel Oils Are Recommended

My attention has been directed to your list of the specifications for fuel oils as published on page 139 of your July 26, 1934, issue, but they do not appear to cover the light oils used in domestic heating systems so I shall be glad if you will furnish the specifications for such oils.—F. P.

The U. S. Bureau of Standards has recently announced that a revision of the standards for fuel oils, CS12-33, has been recommended. These include the properties of light oils and heavy oils. The test requirements are shown in the tables.

The several grades of oil indicated in the tables by members are further described as follows:

No. 1—A distillate oil for use in burners requiring a volatile fuel.

No. 2—A distillate oil for use in burners requiring a moderately volatile fuel.

No. 3—A distillate oil for use in burners requiring a low-viscosity fuel.

No. 4—An oil for use in burners requiring a low viscosity fuel.

No. 5—An oil for use in burners equipped with preheaters permitting a medium-viscosity fuel.

No. 6—An oil for use in burners equipped with preheaters permitting a high-viscosity fuel.

REQUIREMENTS FOR LIGHT FUEL OILS

(All are maximum except as shown)

Grade No.	Flash °F. min./max.	Water and sediment %	Carbon residue %	Distillation, °F. 10%	90%	E.P.
1	110/150	0.05	0.02	420	...	600
2	125/190	0.05	0.05	440	620	min. 600
3*	150/200	0.10	0.15	...	min. 620	...

*Saybolt Universal Viscosity—70 max. at 100° F. No viscosity requirement for Nos. 1 and 2.

Pourpoint of 15° F. (max.) is required for each of the three grades. Lower or higher pourpoints may be specified, but nothing lower than 0° F. shall be required.

Sulphur per cent (total) limited to 0.5 per cent for Nos. 1 and 2; 0.75 per cent for No. 3. The minimum temperature of 620° F. at the 90 per cent point for No. 3 shall be waived when the carbon residue is more than 0.07 per cent and less than 0.15 per cent.

The flashpoints shall meet the legal requirements of the state and city.

REQUIREMENTS FOR HEAVY FUEL OILS

Grade No.	Water and sediment %	Ash %	Viscosity Say. Univ. at 100° F., seconds	Viscosity Furol at 122° F. max./min.
4	1.0	0.1	500 (min. 70)	....
5	1.0	0.15	....	100/26
6	2.0*	...	....	200/100†

*A deduction in quantity shall be made for all water and sediment in excess of 1.0 per cent. †Waived when the carbon residue is 4 per cent or more.

Flashpoint is 150° F., minimum for these three oils.

No. 4 pourpoint may be specified whenever required by conditions of storage or use.

Method Used When Analyzing Natural Gas for Helium

It will be of great assistance if you will give us an outline of the method used for determining helium in natural gas.—P. C. D.

The U. S. Bureau of Mines, Washington, D. C., has recently published a circular, prepared by C. C. Anderson, describing the apparatus and method used at the Cryogenic Laboratory, for determining the helium content of natural gas. Brief quotations from this circular will serve to answer the question:

The quantitative determination of helium in a gaseous mixture is accomplished by the removal of the other constituents from the sample, either by chemical or physical means, leaving only the helium which can be measured directly. Chemical methods, when applied to natural gas, require the burning of the hydrocarbons in oxygen, the absorption of the resulting carbon dioxide in a caustic solution, the removal of the excess oxygen in a suitable solution such as an alkaline pyrogallate, and the elimination of nitrogen by sparking or by combination with hot calcium or magnesium. Such procedures are very slow and tedious compared with the physical method which employs the absorptive property of the activated charcoal to effect the separation of the other constituents from the helium.

When cooled to liquid-air temperatures, activated coconut charcoal absorbs large volumes of the principal constituents of natural gas, such as nitrogen, methane, other gases of the hydrocarbon series, carbon dioxide, and oxygen, if the latter is present in the sample. The thousands of analyses made in the Cryogenic Laboratory indicate that in natural gases of this country hydrogen and neon are either absent or occur in such small percentages as to be absorbed readily by the quantity of charcoal usually employed.

Activated coconut charcoal is an excellent material for the absorption or removal of the various constituents of natural gas and leaves all of the helium for withdrawal and measurement.

The apparatus for separation and measurement of helium consists of the following principal parts: A condensation tube, two charcoal tubes, a Topler mercury pump, and a burette. All of these parts and the necessary mercury traps, stopcocks and manometer are welded together, forming a vacuum-tight apparatus.

Accessory equipment includes a spectroscope, spark coil, six-volt storage battery, a balance for weighing, a gasometer or equivalent for holding the sample before analysis, vacuum flasks for holding liquid air, and pumps or other devices for supplying compressed air and create a vacuum to operate the Topler mercury pump.

After becoming familiar with the apparatus, an analyst can complete determinations in 15 to 30 minutes, depending upon the volume of helium to be pumped out of the apparatus, and with ordinary care results can be duplicated within close ranges.

Reference—U. S. Bureau of Mines, I. C. 6,796, June, 1934; An Apparatus and Method for the Determination of Helium in Natural Gas, by C. C. Anderson.

Properties of Cracked Gasoline Related to Type of Stock

Is the gravity of cracked gasoline related to the type of oil cracked? That is, does the gas-oil from a paraffin crude oil give the same gravity gasoline as an asphalt crude when cracked and run under the same condition?—H. A. K.

The gravities of all fractions from petroleum are always related to the molecular, chemical, composition of the oil charged. Sachanen and Tilicheyev, Chemistry and Technology of Cracking, page 206, state:

"Cracked gasolines of low specific gravities are obtained on cracking paraffin base products, while asphaltic products give, when decomposed, gasoline of a higher specific gravity. The chemical composition of the original product predetermines the characteristics of the cracked gasoline formed."

FIELD PROBLEMS FROM READERS

Edited by Thomas F. Smiley

This department is conducted in order that men connected with the drilling, producing and transporting branches of the petroleum industry may obtain aid in solving problems that confront them in their work. Readers are invited to send questions freely. These questions will be placed in the hands of persons capable of answering them authoritatively, and the answers, based on the best available information, will be published.

Each question should give as much detail as possible, especially if it involves depths of sands, types of sands and operations on adjoining or nearby properties. The source of questions will be considered confidential, and only the initials of the sender will be published. Questions involving patented processes, intricate formulas or estimate of cost cannot be answered. If an immediate answer is important, one will be given by mail when the writer requests it.

In this connection, The Oil and Gas Journal will be glad to publish articles from field men who have devised new methods or improved old ones.

Point at Which Casing Must Be Set Varies With Conditions

What rule, if there is one, is followed about the point at which the different strings of casing should be landed? I always have supposed that in the deep wells especially the operator was governed by the weight of the string that could be landed safely and that he determined the length of the string accordingly, although the character of the formation would necessarily change his program sometimes.—E. S. E.

The point at which casing strings must be set is discussed by H. C. George in his book on "Oil Well Completion and Operation," and the following, which provides an answer to your question, is quoted from that work:

"The distance above the oil sand at which the shoe of the water string is set varies in almost every locality and depends upon the relative position of the upper water and oil sands, the character of the formation and the method of drilling. In localities where it is necessary to shoot the producing formation the casing is set, if possible, at a safe distance above the producing formation. The mechanical conditions of wells govern to a large extent the shooting program. In the Coalinga Field, California, the oil sand in many wells is separated from the upper water sands by a shale bed only a few feet thick. The water string must be set and cemented in this shale break. In contrast with these conditions, the last upper water sand in the Hewitt Field of Oklahoma was usually found from 350 to 400 feet above the first Hewitt oil sand. When drilling with cable tools in this field the water string was usually set just below the bottom of this last upper water sand, which left 300 to 400 feet of open formation above the oil sand that had to be cased later. In many eastern fields, where only small flows of upper water are encountered only within the first few hundred feet, it is customary to set just enough casing to shut off the water, leaving the remainder of the hole open. Oil strings or oil liners are seldom set in the eastern fields, because the formations are hard and do not cave.

"When drilling with cable tools, the principal factors which frequently determine the point at which the various strings of casing must be set are the caving of formations and the hydrostatic head and volume of underground waters. Even though an operator may desire to land a longer string of casing, a depth may be reached in the well where the casing becomes so 'logy' that it cannot be carried deeper, and therefore must be landed, leaving considerable open hole above the oil sand.

"When drilling with rotary tools it is possible in many of the fields to shut off all the water-bearing strata with one string of casing and a short conductor. This string of casing is usually landed and cemented near the top of the oil sand and below the last water sand. If the formation is to be shot the casing policy must be changed accordingly. Selection of the proper depths and formation for landing casing strings is one of the most important features connected with completing oil wells successfully. Frequent and continuous coring has done much in supplying accurate information. Each casing program should protect properly the upper producing sand zones.

"Some operators in the oil fields of southern Oklahoma set the water string in the top of the oil sand when it is possible, or in the 'shell' above the oil sand, to give a firm seat for the shoe and bottom joints of casing. When the water string is set and cemented in the shale above the oil sand, the cement may not make the proper bond with the walls of the hole, on account of the mud coating and improper conditioning of the hole before cementing. If the cement does not set around the bottom joints of the water string they may become loosened later and cause serious trouble before the drilling operation is completed. The best practice favors the setting of casing in the top of the oil sand or in the 'shell' above the sand."

Perplexing Problems Surmounted in Sweet Lake Field Drilling

I would like to find out more about how drilling operations were carried on in the Sweet Lake Field in Louisiana. I am referring to wells drilled in the lake itself, which I understand is quite deep. I understand this is a deep sand area, which I would suppose would greatly increase the difficulties of drilling, since heavy equipment would have to be used. How do they make the necessary foundations? If the rotary system of drilling is used, how do they manage about the mud supply? How deep are wells in this area?—T. D. O.

Sweet Lake was formed about 80 years ago in Cameron Parish, Louisiana, when a marsh fire burned out a deposit of peat, leaving a basin 7 to 10 feet deep, which filled with fresh water. The lake is about 2 miles long and a mile wide. The drilling operations, conducted by the Pure Oil Co., are carried on in the middle of this body of water. The discovery well in the Sweet Lake Field, completed in 1926, went to 5,897 feet, and it was the deepest well on the Gulf Coast at that time. The deepest level reached later was 8,070 feet. Wells in the lake itself are producing from a 7,400-foot horizon, but the drilling equipment used, large and heavy, is capable of going to 10,000 feet or more if required.

Many problems are involved in carrying on oil-field development in circumstances like those which exist at Sweet Lake. They include the setting up and handling of drilling equipment in a lake bed; providing fuel, drilling mud, etc.; transportation of supplies, equipment and materials, and disposition of the product.

The chief problem of such water operations in the past has been the matter of foundations and the setting up of drilling and production equipment. Piling has been used in some fields, but that generally is costly and requires much time. At Sweet Lake, Pure Oil Co. has adopted a matting base on which the substructure is constructed. The matting consists of several layers of plank timbers laid down flat on the bed of the lake. The planks for each layer are fastened together on the surface and then lowered as one piece into the water. Such foundations are provided for the derrick and drilling machinery and also for the power plant for each outfit. Walkways which connect the various wells and operations are built in the form of piers on piling.

The massive equipment used in drilling and the long strings of large pipe run place an extraordinary load on the foundations. The problem of handling such equipment in the middle of a lake, with little room for moving about, is not a simple one. Barge deck space is available when needed, however, and in cementing jobs the cementing trucks are operated from the barge, lashed to the derrick foundation.

The standard setup at Sweet Lake includes three boilers to supply power for drilling. Gas is used for fuel, the supply coming from adjoining wells through lines strung along the walkways connecting the wells. Water for the boilers is pumped from the lake.

Providing an adequate supply of drilling mud was a somewhat perplexing problem. This mud has to be mixed at the company's base of operations some 3 miles distant and carried to the well location by barge. A 500-gallon reserve tank for mud storage is a part of the equipment on each setup. Every precaution is taken to conserve the returns, the discharge being into a system of wooden troughs built on piling.

In handling the production, the oil, and whatever water there is, are pumped together from the field through a 4-inch line to the base of operations. There a treating plant settles out the water. It is impossible to do this out in the field because the lake consists of fresh water used for rice irrigation and oil-field brine must not be mixed with it.

In The Oil and Gas Journal for April 19, 1934, you will find an article giving more details concerning the Sweet Lake operations.

Making Concrete Piling for Soils Unsuitable for Foundations

I would like to get some information relative to the use of concrete piles where they are needed to provide a solid foundation for several buildings in soil that is too sandy and soft. I am figuring on using concrete piles because I understand they can be made right where they are to stand and no piledriver is needed. It seems to me the concrete should be better than wood anyway. Are not wooden piles likely to rot away? I would appreciate some directions concerning the way of putting in concrete piling.—E. T. O.

Concrete piling probably will be most suitable for your purposes. It is virtually indestructible and if you can make the piles in place you can avoid the expense of a drop hammer or steam hammer. In any event you should install the piles with a definite knowledge of the load they are capable of bearing, particularly if the building is to be a heavy and expensive one. There are several engineering formulas for determining the safe loads for piles.

The pile molded in place is made by driving a mandrel into the ground and filling the hole thus formed with concrete. In the case of one widely used pile of this kind a thin steel sheet is fitted over a tapered mandrel before the mandrel is driven into the soil, This steel shell, which is left in the hole when the mandrel is taken out, is then filled with concrete. In the course of time it rusts away.

Another well-known pile which is molded in place employs a hollow mandrel cylindrical in shape. First this mandrel is driven down to the desired depth, and the concrete is poured into it. The mandrel then is raised a little at a time, the concrete flowing out from the bottom and filling the hole in the earth. In many instances these piles thus molded in place are reinforced with steel. Wood piles subjected to alternating wet and dry conditions are likely to rot. Where they are continually submerged in water they are as permanent as stone, barring the presence of marine borers or other animal destroyers.

Why Was It Called That?

HAVING SAND

Many words in oil-field jargon have passed into general use, some of them by reason of their peculiar aptness, becoming permanently fixed in the language. "He has sand" was a common expression in the early days of oil, but it rarely is heard now although Webster's dictionary preserves the word "sand" as slang for courage, pluck, grit. If an old-time oil man wanted to pay a tribute to the fearlessness, hardihood and tenacity of another he would say, "He's got sand." In recent years the word has been supplanted by another—and coarser—one referring to intestinal equipment.

NATURAL GAS DEVELOPMENTS

Committee Will Work Out Dry Gas Contract

President Filley of the Kansas-Oklahoma division of the Mid-Continent Oil & Gas Association has appointed the following committee to work out and propose a standard dry gas contract for acceptance by the association as one of its approved and recommended gas forms:

James Cowles, chairman, Shell Petroleum Corp., Tulsa; D. C. Williams, Continental Oil Co., Ponca City; Ted Goebel, Skelly Oil Co., Tulsa; L. A. Farmer, Oklahoma Natural Gas Corp., Tulsa; Don Sillers, Lone Star Gas Co., Dallas; L. E. Rheinberger, Sinclair Prairie Oil Co., Tulsa; Ross Stuntz, Cities Service Gas Co., Bartlesville; George P. Bunn, Phillips Petroleum Co., Bartlesville; W. F. Lowe, Natural Gasoline Association, Tulsa; Glenn W. Patchett, Mid-Continent Oil and Gas Association, Tulsa.

Fifty-five Mile Gas Line Depends on London Vote

LONDON, Ontario, Nov. 10.—It is expected that the city council will authorize a vote of the ratepayers at the municipal elections on December 3 on the proposal of the City Gas Co., subsidiary of the Union Gas Co., to supply natural gas in place of artificial gas.

The proposal involves the laying of 55 miles of 8-inch transmission line to deliver gas to London from the Dawn Field. With improvements to the distributing system, an outlay of approximately $1,000,000 is contemplated. The City Gas Co. is asking a 20-year franchise, and offering a schedule of rates considerably lower than the present artificial gas rates. It has been supplying artificial gas to London for upwards of 70 years. The available gas supply in areas controlled by the Union Gas Co. is sufficient for the requirements of London, in addition to other communities now served by the Union company; and the two companies guarantee to furnish artificial or mixed gas should the natural gas supply at any time prove insufficient. The present water-gas plant of the City Gas Co. will be maintained as a stand-by plant.

Production of Natural Gas in 1933 Was Practically the Same as During 1932

The marketed production of natural gas, which increased steadily through 1930 but declined in 1931 and 1932, showed little change in 1933 when compared with 1932. The total output for 1933 was 1,555,474,000,000 feet, or only 516,000,000 feet less than the total for 1932. The decrease in output between 1930 and 1933 was due primarily to the curtailment of industrial activity with consumption by domestic and commercial users increasing steadily. In 1933, however, the domestic and commercial consumption showed its first decrease while the consumption for industrial purposes showed a material gain.

The downward trend in the average price paid producers for natural gas continued in 1933 when the average was 6.2 cents per thousand feet compared with 6.4 cents in 1932. The decrease in the average price at the wells in recent years has generally conformed to the decline in Texas, but in 1933 the average for Texas showed a small increase, hence the drop in the national average must be attributed to other states, such as California, West Virginia and Pennsylvania. The average price paid by domestic and commercial consumers decreased in 1933; this marked the first decline in this price since 1908. The prices paid by industrial users and for gas in the field also declined in 1933 with the result that the average value of all the gas at points of consumption decreased from 24.7 cents per thousand feet in 1932 to 23.7 cents per thousand feet in 1933. As this decline exceeded the drop in the well price it is obvious that the average spread between the buying and selling prices for natural gas in 1933 was less than in 1932.

The total consumption of natural gas production (1,555,474,000,000 feet) plus imports (83,000,000 feet) minus exports (2,158,000,000 feet), amounted to 1,553,399,000,000 feet of which 494,459,000,000 feet (32 per cent) was used for field purposes, 368,774,000,000 feet (24 per cent) was used for domestic and commercial purposes, 186,781,000,000 feet (12 per cent) was burned in the manufacture of carbon black, 102,601,000,000 feet (7 per cent) was used for fuel by public utility power plants, 66,333,000,000 feet (4 per cent) was used as fuel at petroleum refineries, leaving 334,451,000,000 feet (21 per cent) consumed for other industrial purposes. These data indicate increases in the ratios for carbon black, and other industrial balanced by decreases in the ratios for the other major classes of consumption.

The number of domestic and commercial consumers supplied with natural gas in 1933 was 7,166,000, an increase of 3 per cent over 1932. Of this total 5,205,000 were consumers of straight natural gas and 1,961,000 were consumers of mixed gas. From the standpoint of number of consumers, the majority of the states, including the three leaders, California, Ohio and Illinois, showed gains in 1933.

The decrease of 34,919,000,000 feet in the consumption of natural gas for field purposes between 1932 and 1933 is undoubtedly related to the decline of 18 per cent in the number of wells drilled during the same period.

Although details are lacking as to which industries increased their consumption of natural gas in 1933, a large proportion of the gain was in the leading steel and glass producing states. Consumption of natural gas at cement plants also increased in 1933.

Total interstate shipments and exports of natural gas reached a new high level of 346,810,400,000 feet in 1933. Texas replaced Louisiana as the leading shipper of natural gas; gas from Texas moved to 13 states and to Mexico in 1933. Construction work on new lines was at a

(Continued on Page 169)

Best Gas Test Reported in St. Lawrence Valley

CHATHAM, Ontario, Nov. 10.—In the province of Quebec, Carl M. Mohr and associates are preparing for additional development work on acreage on the north shore of the St. Lawrence River about 30 miles east of Montreal. Mohr's No. 1 was recently finished on Lot 729 near the village of Lanoraie, in Portneuf County. It entered the Trenton limestone at 840 feet and encountered the first gas at about 1,000 feet, with around 100 pounds pressure. On deepening to 1,200 feet, a second gas horizon was encountered, with 350 pounds pressure, the gas flame from the well head burning to about 70 feet. Drilling was handled by William R. McMaster of Cainsville, Ontario, on acreage in which Roadbuilders, Ltd., of Toronto, was interested with the Mohr syndicate. Analysis of the gas shows 93.2 per cent methane, with the following other contents: Ethane, 1.7 per cent; carbon dioxide, .4 per cent; oxygen, 0.3 per cent; helium, 0.01 per cent; nitrogen (by difference), 4.3 per cent; and traces of other hydrocarbons. No sulphur was present.

The strike is the most important yet recorded in the St. Lawrence Valley since the development of 1907, when a short-lived production was developed near St. Baranabe. In recent years there has been considerable drilling, chiefly on the south shore of the St. Lawrence, where a number of deep tests failed to get commercial production. At least one of these tests was carried to more than 6,000 feet. In the meantime, small gas flows, believed to be "drift" gas, were encountered in a series of shallow wells on the north shore at depths varying from 100 to 300 feet.

SURFACE GAS FATAL

LLOYDMINSTER, Sask., Nov. 10.—A flow of surface gas, struck in a water well on the Eddie Payne farm 8 miles north of Lloydminster, resulted in the death of Archie Downey, who was working on the drilling outfit.

SUMMARY OF NATURAL GAS STATISTICS, 1933

	Production			Consumption								
				Domestic (inc. commercial)			Industrial					
							Field (drilling, pumping, operating gasoline plants, etc.)		Manufacture of carbon black		Fuel at petroleum refineries, electric public-utility power plants, and other industrial			
	Millions of cu. ft.	Average value at wells per M cu. ft. (cents)	Average value at points of consumption per M cu. ft. (cents)	Thousands of consumers	Millions of cu. ft.	Average value at points of consumption per M cu. ft. (cents)	Millions of cu. ft.	Value (thousands of dollars)	Millions of cu. ft.	Value of points of consumption (thousands of dollars)	Millions of cu. ft. Petroleum refineries	Millions of cu. ft. Electric public utility power plants	Millions of cu. ft. Other industrial	Value at points of consumption (thousands of dollars)*
Alabama	.....	...	...	22	959	113.8	.....	.....	.....	.....	.....	.....	6,551	1,101
Arkansas	8,288	5.5	21.9	62	6,544	50.7	6,288	425	.....	.....	761	743	8,439	1,235
California	259,799	6.4	28.7	1,353	64,753	85.8	113,107	7,392	.....	.....	17,519	15,882	48,738	11,513
Colorado	2,449	3.2	27.4	93	4,793	82.6	727	25	.....	.....	5	420	9,917	1,476
Georgia	.....	...	...	60	2,508	104.5	.....	.....	.....	.....	.....	411	1,631	382
Illinois	1,631	8.9	58.3	1,036	17,272	133.5	1,537	123	.....	.....	179	.....	14,353	3,798
Indiana	1,544	27.1	58.2	63	1,256	105.5	3	1	.....	.....	.....	2,315	2,387	1,321
Iowa	.....	...	...	78	2,199	92.1	.....	.....	.....	.....	.....	2,259	6,950	1,569
Kansas	41,596	6.0	31.7	188	18,481	58.4	7,930	682	.....	.....	963	10,800	19,868	4,282
Kentucky	31,380	12.8	46.4	162	9,528	50.6	718	107	.....	.....	.....	.....	2,976	882
Louisiana	197,826	3.1	16.3	141	8,733	59.7	10,145	426	40,665	1,050	7,339	18,050	30,668	5,804
Michigan	1,523	14.3	41.6	28	432	95.4	557	63	.....	.....	40	.....	498	139
Mississippi	8,679	4.1	25.0	26	2,552	51.8	26	4	.....	.....	.....	883	2,557	426
Missouri	673	8.8	56.5	362	11,938	82.0	18	3	.....	.....	5	2,218	13,405	2,705
Montana	14,391	4.1	30.3	26	6,073	41.0	867	84	.....	.....	67	603	4,612	879
Nebraska	.....	...	...	55	3,107	75.3	.....	.....	.....	.....	.....	1,701	5,485	1,249
New Mexico	19,148	2.4	12.9	13	1,604	52.0	9,062	253	.....	.....	.....	2,133	601	390
New York	6,865	28.1	70.5	343	15,311	76.1	638	182	.....	.....	479	331	3,153	1,352
Ohio	47,929	17.1	52.4	1,162	62,043	61.4	2,284	835	.....	.....	22	5,112	22,301	9,772
Oklahoma	245,759	3.9	9.7	237	22,623	41.7	178,531	7,105	(†)	(†)	7,565	6,470	†27,305	†8,816
Pennsylvania	63,579	23.8	50.3	644	38,893	61.7	4,261	1,229	.....	.....	783	21	29,669	8,974
South Dakota	10	10.0	30.0	13	1,361	63.0	.....	.....	.....	.....	.....	128	1,775	329
Tennessee	48	6.3	16.7	41	2,927	67.7	.....	.....	.....	.....	.....	3,201	1,241	807
Texas	475,691	2.4	18.6	529	34,357	68.4	137,775	7,290	138,231	2,404	26,084	27,792	48,189	12,562
West Virginia	100,653	13.0	41.9	170	19,367	36.4	11,220	2,430	.....	.....	887	75	15,384	4,216
Wyoming	25,830	3.1	13.2	16	3,394	39.0	7,750	247	(†)	(†)	3,463	288	†5,193	†431
Other	178	6.7	51.7	195	5,735	74.5	10	1	7,685	310	182	1,165	9,391	1,919
Total, 1933	1,555,474	6.2	23.7	7,166	368,774	68.4	494,459	28,908	186,781	3,764	66,333	102,601	334,451	83,156
Total, 1932	2,555,990	6.4	24.7	6,961	385,687	69.3	529,378	33,585	168,237	2,893	67,467	107,329	396,127	81,268

*Includes value of gas used at petroleum refineries and electric public-utility power plants. †Gas used in manufacture of carbon black included under "Other States" for United States total and under "Other Industrial" for state total to avoid revealing figures of individual operators.

FIELD PROBLEMS FROM READERS

Edited by Thomas F. Smiley

This department is conducted in order that men connected with the drilling, producing and transporting branches of the petroleum industry may obtain aid in solving problems that confront them in their work. Readers are invited to send questions freely. These questions will be placed in the hands of persons capable of answering them authoritatively, and the answers, based on the best available information, will be published.

Each question should give as much detail as possible, especially if it involves depths of sands, types of sands and operations on adjoining or nearby properties. The source of questions will be considered confidential, and only the initials of the sender will be published. Questions involving patented processes, intricate formulas or estimate of cost cannot be answered. If an immediate answer is important, one will be given by mail when the writer requests it.

In this connection, The Oil and Gas Journal will be glad to publish articles from field men who have devised new methods or improved old ones.

Point at Which Casing Must Be Set Varies With Conditions

What rule, if there is one, is followed about the point at which the different strings of casing should be landed? I always have supposed that in the deep wells especially the operator was governed by the weight of the string that could be landed safely and that he determined the length of the string accordingly, although the character of the formation would necessarily change his program sometimes.—E. S. E.

The point at which casing strings must be set is discussed by H. C. George in his book on "Oil Well Completion and Operation," and the following, which provides an answer to your question, is quoted from that work:

"The distance above the oil sand at which the shoe of the water string is set varies in almost every locality and depends upon the relative position of the upper water and oil sands, the character of the formation and the method of drilling. In localities where it is necessary to shoot the producing formation the casing is set, if possible, at a safe distance above the producing formation. The mechanical conditions of wells govern to a large extent the shooting program. In the Coalinga Field, California, the oil sand in many wells is separated from the upper water sands by a shale bed only a few feet thick. The water string must be set and cemented in this shale break. In contrast with these conditions, the last upper water sand in the Hewitt Field of Oklahoma was usually found from 350 to 400 feet above the first Hewitt oil sand. When drilling with cable tools in this field the water string was usually set just below the bottom of this last upper water sand, which left 300 to 400 feet of open formation above the oil sand that had to be cased later. In many eastern fields, where only small flows of upper water are encountered only within the first few hundred feet, it is customary to set just enough casing to shut off the water, leaving the remainder of the hole open. Oil strings or oil liners are seldom set in the eastern fields, because the formations are hard and do not cave.

"When drilling with cable tools, the principal factors which frequently determine the point at which the various strings of casing must be set are the caving of formations and the hydrostatic head and volume of underground waters. Even though an operator may desire to land a longer string of casing, a depth may be reached in the well where the casing becomes so 'logy' that it cannot be carried deeper, and therefore must be landed, leaving considerable open hole above the oil sand.

"When drilling with rotary tools it is possible in many of the fields to shut off all the water-bearing strata with one string of casing and a short conductor. This string of casing is usually landed and cemented near the top of the oil sand and below the last water sand. If the formation is to be shot the casing policy must be changed accordingly. Selection of the proper depths and formation for landing casing strings is one of the most important features connected with completing oil wells successfully. Frequent and continuous coring has done much in supplying accurate information. Each casing program should protect properly the upper producing sand zones.

"Some operators in the oil fields of southern Oklahoma set the water string in the top of the oil sand when it is possible, or in the 'shell' above the oil sand, to give a firm seat for the shoe and bottom joints of casing. When the water string is set and cemented in the shale above the oil sand, the cement may not make the proper bond with the walls of the hole, on account of the mud coating and improper conditioning of the hole before cementing. If the cement does not set around the bottom joints of the water string they may become loosened later and cause serious trouble before the drilling operation is completed. The best practice favors the setting of casing in the top of the oil sand or in the 'shell' above the sand."

Perplexing Problems Surmounted in Sweet Lake Field Drilling

I would like to find out more about how drilling operations were carried on in the Sweet Lake Field in Louisiana. I am referring to wells drilled in the lake itself, which I understand is quite deep. I understand this is a deep sand area, which I would suppose would greatly increase the difficulties of drilling, since heavy equipment would have to be used. How do they make the necessary foundations? If the rotary system of drilling is used, how do they manage about the mud supply? How deep are wells in this area?—T. D. O.

Sweet Lake was formed about 80 years ago in Cameron Parish, Louisiana, when a marsh fire burned out a deposit of peat, leaving a basin 7 to 10 feet deep, which filled with fresh water. The lake is about 2 miles long and a mile wide. The drilling operations, conducted by the Pure Oil Co., are carried on in the middle of this body of water. The discovery well in the Sweet Lake Field, completed in 1926, went to 5,897 feet, and it was the deepest well on the Gulf Coast at that time. The deepest level reached later was 8,070 feet. Wells in the lake itself are producing from a 7,400-foot horizon, but the drilling equipment used, large and heavy, is capable of going to 10,000 feet or more if required.

Many problems are involved in carrying on oil-field development in circumstances like those which exist at Sweet Lake. They include the setting up and handling of drilling equipment in a lake bed; providing fuel, drilling mud, etc.; transportation of supplies, equipment and materials, and disposition of the product.

The chief problem of such water operations in the past has been the matter of foundations and the setting up of drilling and production equipment. Piling has been used in some fields, but that generally is costly and requires much time. At Sweet Lake, Pure Oil Co. has adopted a matting base on which the substructure is constructed. The matting consists of several layers of plank timbers laid down flat on the bed of the lake. The planks for each layer are fastened together on the surface and then lowered as one piece into the water. Such foundations are provided for the derrick and drilling machinery and also for the power plant for each outfit. Walkways which connect the various wells and operations are built in the form of piers on piling.

The massive equipment used in drilling and the long strings of large pipe run place an extraordinary load on the foundations. The problem of handling such equipment in the middle of a lake, with little room for moving about, is not a simple one. Barge deck space is available when needed, however, and in cementing jobs the cementing trucks are operated from the barge, lashed to the derrick foundation.

The standard setup at Sweet Lake includes three boilers to supply power for drilling. Gas is used for fuel, the supply coming from adjoining wells through lines strung along the walkways connecting the wells. Water for the boilers is pumped from the lake.

Providing an adequate supply of drilling mud was a somewhat perplexing problem. This mud has to be mixed at the company's base of operations some 3 miles distant and carried to the well location by barge. A 500-gallon reserve tank for mud storage is a part of the equipment on each setup. Every precaution is taken to conserve the returns, the discharge being into a system of wooden troughs built on piling.

In handling the production, the oil, and whatever water there is, are pumped together from the field through a 4-inch line to the base of operations. There a treating plant settles out the water. It is impossible to do this out in the field because the lake consists of fresh water used for rice irrigation and oil-field brine must not be mixed with it.

In The Oil and Gas Journal for April 19, 1934, you will find an article giving more details concerning the Sweet Lake operations.

Making Concrete Piling for Soils Unsuitable for Foundations

I would like to get some information relative to the use of concrete piles where they are needed to provide a solid foundation for several buildings in soil that is too sandy and soft. I am figuring on using concrete piles because I understand they can be made right where they are to stand and no piledriver is needed. It seems to me the concrete should be better than wood anyway. Are not wooden piles likely to rot away? I would appreciate some directions concerning the way of putting in concrete piling.—E. T. O.

Concrete piling probably will be most suitable for your purposes. It is virtually indestructible and if you can make the piles in place you can avoid the expense of a drop hammer or steam hammer. In any event you should install the piles with a definite knowledge of the load they are capable of bearing, particularly if the building is to be a heavy and expensive one. There are several engineering formulas for determining the safe loads for piles.

The pile molded in place is made by driving a mandrel into the ground and filling the hole thus formed with concrete. In the case of one widely used pile of this kind a thin steel sheet is fitted over a tapered mandrel before the mandrel is driven into the soil, This steel shell, which is left in the hole when the mandrel is taken out, is then filled with concrete. In the course of time it rusts away.

Another well-known pile which is molded in place employs a hollow mandrel cylindrical in shape. First this mandrel is driven down to the desired depth, and the concrete is poured into it. The mandrel then is raised a little at a time, the concrete flowing out from the bottom and filling the hole in the earth. In many instances these piles thus molded in place are reinforced with steel. Wood piles subjected to alternating wet and dry conditions are likely to rot. Where they are continually submerged in water they are as permanent as stone, barring the presence of marine borers or other animal destroyers.

Why Was It Called That?

HAVING SAND

Many words in oil-field jargon have passed into general use, some of them by reason of their peculiar aptness, becoming permanently fixed in the language. "He has sand" was a common expression in the early days of oil, but it rarely is heard now although Webster's dictionary preserves the word "sand" as slang for courage, pluck, grit. If an old-time oil man wanted to pay a tribute to the fearlessness, hardihood and tenacity of another he would say, "He's got sand." In recent years the word has been supplanted by another—and coarser—one referring to intestinal equipment.

NATURAL GAS DEVELOPMENTS

Committee Will Work Out Dry Gas Contract

President Filley of the Kansas-Oklahoma division of the Mid-Continent Oil & Gas Association has appointed the following committee to work out and propose a standard dry gas contract for acceptance by the association as one of its approved and recommended gas forms:

James Cowles, chairman, Shell Petroleum Corp., Tulsa; D. C. Williams, Continental Oil Co., Ponca City; Ted Goebel, Skelly Oil Co., Tulsa; L. A. Farmer, Oklahoma Natural Gas Corp., Tulsa; Don Sillers, Lone Star Gas Co., Dallas; L. E. Rheinberger, Sinclair Prairie Oil Co., Tulsa; Ross Stuntz, Cities Service Gas Co., Bartlesville; George P. Bunn, Phillips Petroleum Co., Bartlesville; W. F. Lowe, Natural Gasoline Association, Tulsa; Glenn W. Patchett, Mid-Continent Oil and Gas Association, Tulsa.

Fifty-five Mile Gas Line Depends on London Vote

LONDON, Ontario, Nov. 10.—It is expected that the city council will authorize a vote of the ratepayers at the municipal elections on December 3 on the proposal of the City Gas Co., subsidiary of the Union Gas Co., to supply natural gas in place of artificial gas.

The proposal involves the laying of 55 miles of 8-inch transmission line to deliver gas to London from the Dawn Field. With improvements to the distributing system, an outlay of approximately $1,000,000 is contemplated. The City Gas Co. is asking a 20-year franchise, and offering a schedule of rates considerably lower than the present artificial gas rates. It has been supplying artificial gas to London for upwards of 70 years. The available gas supply in areas controlled by the Union Gas Co. is sufficient for the requirements of London, in addition to other communities now served by the Union company; and the two companies guarantee to furnish artificial or mixed gas should the natural gas supply at any time prove insufficient. The present water-gas plant of the City Gas Co. will be maintained as a stand-by plant.

Production of Natural Gas in 1933 Was Practically the Same as During 1932

The marketed production of natural gas, which increased steadily through 1930 but declined in 1931 and 1932, showed little change in 1933 when compared with 1932. The total output for 1933 was 1,555,474,000,000 feet, or only 516,000,000 feet less than the total for 1932. The decrease in output between 1930 and 1933 was due primarily to the curtailment of industrial activity with consumption by domestic and commercial users increasing steadily. In 1933, however, the domestic and commercial consumption showed its first decrease while the consumption for industrial purposes showed a material gain.

The downward trend in the average price paid producers for natural gas continued in 1933 when the average was 6.2 cents per thousand feet compared with 6.4 cents in 1932. The decrease in the average price at the wells in recent years has generally conformed to the decline in Texas, but in 1933 the average for Texas showed a small increase, hence the drop in the national average must be attributed to other states, such as California, West Virginia and Pennsylvania. The average price paid by domestic and commercial consumers decreased in 1933; this marked the first decline in this price since 1908. The prices paid by industrial users and for gas in the field also declined in 1933 with the result that the average value of all the gas at points of consumption decreased from 24.7 cents per thousand feet in 1932 to 23.7 cents per thousand feet in 1933. As this decline exceeded the drop in the well price it is obvious that the average spread between the buying and selling prices for natural gas in 1933 was less than in 1932.

The total consumption of natural gas production (1,555,474,000,000 feet) plus imports (83,000,000 feet) minus exports (2,158,000,000 feet), amounted to 1,553,399,000,000 feet of which 494,459,000,000 feet (32 per cent) was used for field purposes, 368,774,000,000 feet (24 per cent) was used for domestic and commercial purposes, 186,781,000,000 feet (12 per cent) was burned in the manufacture of carbon black, 102,601,000,000 feet (7 per cent) was used for fuel by public utility power plants, 66,333,000,000 feet (4 per cent) was used as fuel at petroleum refineries, leaving 334,451,000,000 feet (21 per cent) consumed for other industrial purposes. These data indicate increases in the ratios for carbon black, and other industrial balanced by decreases in the ratios for the other major classes of consumption.

The number of domestic and commercial consumers supplied with natural gas in 1933 was 7,166,000, an increase of 3 per cent over 1932. Of this total 5,205,000 were consumers of straight natural gas and 1,961,000 were consumers of mixed gas. From the standpoint of number of consumers, the majority of the states, including the three leaders, California, Ohio and Illinois, showed gains in 1933.

The decrease of 34,919,000,000 feet in the consumption of natural gas for field purposes between 1932 and 1933 is undoubtedly related to the decline of 18 per cent in the number of wells drilled during the same period.

Although details are lacking as to which industries increased their consumption of natural gas in 1933, a large proportion of the gain was in the leading steel and glass producing states. Consumption of natural gas at cement plants also increased in 1933.

Total interstate shipments and exports of natural gas reached a new high level of 346,810,400,000 feet in 1933. Texas replaced Louisiana as the leading shipper of natural gas; gas from Texas moved to 13 states and to Mexico in 1933. Construction work on new lines was at a

(Continued on Page 169)

Best Gas Test Reported in St. Lawrence Valley

CHATHAM, Ontario, Nov. 10.—In the province of Quebec, Carl M. Mohr and associates are preparing for additional development work on acreage on the north shore of the St. Lawrence River about 30 miles east of Montreal. Mohr's No. 1 was recently finished on Lot 729 near the village of Lanoraie, in Portneuf County. It entered the Trenton limestone at 840 feet and encountered the first gas at about 1,000 feet, with around 100 pounds pressure. On deepening to 1,200 feet, a second gas horizon was encountered, with 350 pounds pressure, the gas flame from the well head burning to about 70 feet. Drilling was handled by William R. McMaster of Cainsville, Ontario, on acreage in which Roadbuilders, Ltd., of Toronto, was interested with the Mohr syndicate. Analysis of the gas shows 93.2 per cent methane, with the following other contents: Ethane, 1.7 per cent; carbon dioxide, .4 per cent; oxygen, 0.3 per cent; helium, 0.01 per cent; nitrogen (by difference), 4.3 per cent; and traces of other hydrocarbons. No sulphur was present.

The strike is the most important yet recorded in the St. Lawrence Valley since the development of 1907, when a short-lived production was developed near St. Baranabe. In recent years there has been considerable drilling, chiefly on the south shore of the St. Lawrence, where a number of deep tests failed to get commercial production. At least one of these tests was carried to more than 6,000 feet. In the meantime, small gas flows, believed to be "drift" gas, were encountered in a series of shallow wells on the north shore at depths varying from 100 to 300 feet.

SURFACE GAS FATAL

LLOYDMINSTER, Sask., Nov. 10.—A flow of surface gas, struck in a water well on the Eddie Payne farm 8 miles north of Lloydminster, resulted in the death of Archie Downey, who was working on the drilling outfit.

SUMMARY OF NATURAL GAS STATISTICS, 1933

	Production		Consumption									
			Domestic (inc. commercial)		Industrial							
					Field (drilling, pumping, operating gasoline plants, etc.)		Manufacture of carbon black		Fuel at petroleum refineries, electric public-utility power plants, and other industrial			
	Millions of cu. ft.	Average value at wells per M cu. ft. (cents)	Thousands of consumers	Millions of cu. ft.	Millions of cu. ft.	Value (thousands of dollars)	Millions of cu. ft.	Value of points of consumption (thousands of dollars)	Millions of cu. ft. Petroleum refineries	Millions of cu. ft. Electric public utility power plants	Millions of cu. ft. Other industrial	Value at points of consumption (thousands of dollars)*
Alabama	.....	...	22	959	113.8	.....	.....	.....	.....	.....	6,551	1,101
Arkansas	8,288	5.5	21.9	62	6,544	50.7	6,288	425	.....	.....	761	743	8,439	1,235
California	259,799	6.4	28.7	1,353	64,753	85.8	113,107	7,392	.....	.....	17,519	15,682	48,738	11,513
Colorado	2,449	3.2	27.4	93	4,792	82.6	727	26	.....	.....	5	420	9,917	1,475
Georgia	.....	...	...	60	2,508	104.5	.....	.....	.....	.....	.....	411	1,631	382
Illinois	1,631	3.0	58.3	1,086	17,372	132.5	1,537	123	.....	.....	179	.....	14,353	3,798
Indiana	1,544	27.1	58.2	63	1,286	105.5	8	1	.....	.....	.....	2,315	2,387	1,321
Iowa	.....	...	...	78	2,199	92.1	.....	.....	.....	.....	.....	2,259	6,950	1,509
Kansas	41,596	6.0	31.7	188	18,481	58.4	7,930	683	.....	.....	983	10,800	18,568	4,288
Kentucky	31,380	13.8	46.4	162	9,528	50.6	718	107	.....	.....	.....	.....	2,976	883
Louisiana	197,826	3.1	16.3	141	8,733	59.7	10,145	426	40,865	1,050	7,339	19,050	30,668	5,804
Michigan	1,523	14.3	41.6	28	433	95.4	557	63	.....	.....	40	.....	498	189
Mississippi	8,679	4.1	25.0	36	2,552	51.8	26	4	.....	.....	.....	883	2,557	426
Missouri	673	8.8	56.5	362	11,938	82.0	18	3	.....	.....	5	2,218	13,405	2,705
Montana	14,391	4.1	30.3	26	6,073	41.0	867	84	.....	.....	67	603	4,612	870
Nebraska	.....	...	...	55	3,107	75.3	.....	.....	.....	.....	.....	1,701	5,485	1,249
New Mexico	19,148	2.4	12.9	13	1,604	53.0	9,062	253	.....	.....	.....	2,133	601	380
New York	6,865	28.1	70.5	343	15,311	76.1	638	182	.....	.....	479	331	3,153	1,362
Ohio	47,929	17.1	52.4	1,162	62,043	61.4	3,284	835	.....	.....	23	5,112	22,301	9,772
Oklahoma	245,759	3.9	9.7	237	22,623	41.7	178,531	7,105	(†)	(†)	7,565	6,470	†27,305	†3,816
Pennsylvania	63,579	23.8	50.3	644	35,893	61.7	4,261	1,229	.....	.....	783	21	29,669	8,974
South Dakota	10	10.0	30.0	12	1,361	63.0	.....	.....	.....	.....	.....	128	1,775	329
Tennessee	48	6.3	16.7	41	2,927	67.7	.....	.....	.....	.....	.....	3,201	1,241	807
Texas	475,891	2.4	15.6	529	24,357	68.4	137,775	7,290	138,231	2,404	26,084	27,792	48,189	12,362
West Virginia	100,653	18.0	41.9	170	19,367	36.4	11,220	2,420	.....	.....	887	75	15,384	4,216
Wyoming	25,830	3.1	13.2	16	3,394	39.0	7,750	247	(†)	(†)	3,463	288	†5,192	†421
Other	178	6.7	51.7	195	5,735	74.5	10	1	7,635	310	183	1,165	9,391	1,919
Total, 1933	1,555,474	6.2	23.7	7,166	368,774	68.4	494,459	28,908	186,781	3,764	66,233	102,601	334,451	83,166
Total, 1932	2,555,990	6.4	24.7	6,961	385,987	69.3	529,378	33,535	168,237	2,893	67,467	107,239	296,127	81,368

*Includes value of gas used at petroleum refineries and electric public-utility power plants. †Gas used in manufacture of carbon black included under "Other States" for United States total and under "Other industrial" for state total to avoid revealing figures of individual operators.

PERSONAL PARAGRAPHS

H. B. BURLESON, of Bridger, Mont., was in Casper, Wyo., the past week on business with the Ohio Oil Company.

• • •

THEODORE A. MORGAN, state oil umpire of Kansas, spent several days in Tulsa last week conferring with Mid-Continent oil executives.

• • •

R. T. FRICK, Pittsburgh, Pa., vice president of Frick-Reid Supply Corporation, stopped in Tulsa last week before going to the American Petroleum Institute convention in Dallas, Tex.

• • •

J. J. COSGROVE, New York City, general counsel for Continental Oil Company, was in Tulsa last week attending the discussions at the Mid-Continent Oil and Gas Association, on what constitutes depletion.

• • •

WALTER E. COOKE, of Paterson, N. J., associated with R. L. GAY in discovery of the Zwolle Field, Louisiana, and who still has large holdings in Sabine Parish, Louisiana, was a Shreveport and East Texas visitor last week.

• • •

CAMILLO GUITERREZ, production engineer of the Carter Oil Company, in the Ponca City, Okla.. area, has resigned to return to his native home of Bogota, Colombia, to become production engineer for the Imperial Oil Company. Mr. Guiterrez is a graduate of the University of Oklahoma.

• • •

K. R. KINGSBURY, president of the Standard Oil Company of California, is in London, England, on business.

• • •

EDWARD E. FLEMMING has been appointed purchasing agent, Shell Petroleum Corporation, Tulsa, succeeding JOHN LONG, deceased.

• • •

JOHN REDMON, geologist in Kansas for the National Refining Company, has been made manager of the company's operations in that State.

• • •

N. R. CRAWFORD, executive department, Dowell Incorporated, has been visiting at the Tulsa office and returned to Midland, Mich., last week.

• • •

J. H. GARDNER, president of the Gardner-Denver Company, of Quincy, Ill., is in Johannesburg, South Africa, on a tour of that part of the world.

• • •

A. C. HENSON, formerly division manager, production department, Shell Petroleum Corporation, Houston, Tex.. has resigned to go into business for himself.

• • •

J. C. ELLIS, president of the Allied Minerals Incorporated, of Houston, Tex., has returned to his desk, after spending several weeks in the East on a business trip.

• • •

R. G. STEWART, director of the Standard Oil Company of New Jersey in charge of domestic sales with other sales officials, are now on a trip visiting the company's principal marketing points.

• • •

W. B. McCLUER, assistant director of research of the petroleum refining laboratory at Pennsylvania State College, has completed a speaking tour among the larger universities of the Northeast and Canada.

L. E. BOOTH, Muskogee Oil & Gas Company, is visiting his mother at Marietta, Ohio.

• • •

CLIFFORD ZEHRUNG, General Paint Corporation, is on vacation at Forest Park, near Siloam Springs, Ark.

• • •

W. FULTON, of United Gas Company, Houston, Tex., was a visitor at Warren Petroleum Company offices last week.

• • •

S. D. HUNT, purchasing agent for the Moorlane Companies, is in the Houston, Tex., office of the firm for two weeks.

• • •

D. C. WIXSON, manager of station operations of Mid-Continent Petroleum Corporation, has been inspecting offices in Indiana and Iowa.

• • •

R. W. McDOWELL, vice president, Mid-Continent Petroleum Corporation, in charge of marketing, came home from a business trip last week, stayed home two days, and left on another trip.

• • •

L. B. SIMMONS, president, Rock Island Refining Company, of Duncan, Okla., purchased the $25,000 bond issue voted by Duncan citizens to be used in matching Federal funds in winter relief projects. A 500-acre lake site will be purchased 9½ miles northeast of Duncan, and FERA labor will build the lake.

H. H. WILSON, representative of Frick-Reid Supply Corporation, Houston and Dallas, Tex., was a Tulsa visitor last week.

• • •

W. E. RICE, of Great Falls, Mont., independent oil operator and refiner, was in Ontario, Canada, the past week consulting a medical specialist.

• • •

HAROLD L. NUTTING, of Los Angeles, Calif., president of the Mid American Oil Corporation, Chicago, was in Casper, Wyo., conferring with company geologists, E. W. KRAMPERT and A. F. BARRETT.

• • •

HARRY W. SCHEUTZ, vice president, Colona division, Pittsburgh Screw & Bolt Company, made his trip to the American Petroleum Institute convention in Dallas, Tex., via Tulsa, arriving early last week.

• • •

P. G. WEIDNER, of Tulsa, operating superintendent of gas plants and refinery of the Stanolind Oil & Gas Company, spent several days in Casper, and Midwest, Wyo., the past week. Mr. Weidner was formerly located in Casper.

• • •

ROY BURKETT, formerly with the Mid-Continent Petroleum Corporation and the Globe Oil & Refining Company, has become affiliated with the Marathon Oil Company as its lubricating oil representative in Kansas and eastern Colorado.

• • •

D. F. GERSTENBERGER and G W. MILLER, of the Universal Oil Products Company were in Tulsa during the past week.

• • •

ANDRE DRAGULANESCU and ROMEO PLESOVANU, of the National Supply Company, left New York City last week on a trip to European points.

• • •

L. W. SAUNDERS, petroleum engineer and geologist of the Ohio Oil Company with offices at Bakersfield, Calif., has resigned in order to enter general consulting work.

• • •

E. J. BEERS, traffic manager of the British-American Oil Company's refinery at Coutts, Alberta, has resigned to join the office staff of the Home Oil Company at Great Falls, Mont.

• • •

M. D. KEMP, of the Maple Leaf Petroleums' refinery at Coutts, Alberta, has joined the staff of the British American Oil Company refinery there as traffic manager.

• • •

L. V. COLLINS has resigned as secretary of the American Iron and Steel Institute to become associated with the legal department of the Socony-Vacuum Oil Company.

• • •

THOMAS PITTMAN, foreman at the Maple Leaf Petroleums' refinery at Coutts, Alberta, has resigned to join the Home Oil Company staff at Great Falls, Mont. He is succeeded as foreman by A. T. BOWEN.

• • •

J. MURRAY WAUGH, accountant in the Maple Leaf Petroleums' office at Coutts, Alberta, was married to MISS JESSIE ELLEN GILLIES, of Saskatoon, Saskatchewan. Mr. and Mrs. Waugh will make their home at Coutts.

DO YOU REMEMBER?

From The Oil and Gas Journal Files

25 Years Ago

November 15, 1909

The Oklahoma Pipe Line Co. has been granted an Oklahoma charter. It was approved November 12. The new line will take Glenn Pool oil now being moved by the Prairie, permitting the latter company to move a greater quantity of oil from the other northern Oklahoma fields for shipment to its northern and eastern customers.

Stock in the Texas Co., par $100, is selling from $194 to $200 per share. It will pay $17 per share in dividends this year.

Andrew Denzel Langham and Miss Mabel Clare Markham, daughter of C. H. Markham, general manager of Gulf Pipe Line Co., were married in Beaumont, Tex., on November 11.

20 Years Ago

November 12, 1914

The citizens of Drumright, Okla.. have changed the name of their town to Markham, in honor of John H. Markham, Jr., as he started the development work in that part of the Cushing Field.

Three hundred seventy-eight wells in the Cushing Field in Oklahoma produced 153,473 bbls. per day as an average for the past week, an average of 429 bbls. per well per day. White and Sinclair own the most wells, 66, and had the largest production 24,050 bbls. The Producers Oil Co. (the Texas Co.) is second in production and the Prairie Oil & Gas Co. is second in number of wells.

Mrs. Delia Newell Snow, widow of James H. Snow, who supervised the building of the first pipe line to the Atlantic Seaboard, dies in Titusville, Pa. Deceased was a sister of Patrick and John Newell and of Mrs. Daniel O'Day.

10 Years Ago

November 13, 1924

Joseph Seep of Oil City, Pa., and William Hanley, of Bradford, Pa.. well known oil men, have been honored by Pope Pious XI, who has made them Knights of the Order of St. Gregory.

Robert P. Lockhart, widely known oil man, died recently in Houston, Tex. He was a brother of H. J. Lockhart of the Parkersburg Rig & Reel Co., and W. E. Lockhart of the Producers & Refiners Corp.

An automobile statistician has dug up the fact that 25 years ago (in June, 1899), there were less than 200 automobiles owned in New York City, and less than 50 in Philadelphia. Cleveland had 12, St. Louis 6, Chicago "several"; the State of California 2. There appears to have been none in Detroit.

The Shaffer Oil & Refining Co. announces that it will move its general offices from Chicago to Tulsa.

A. G. HAGLUND, vice president and works manager of the Axelson Manufacturing Company, is on a tour of South American oil fields.

* * *

R. SIEBERT, of the construction department of the Cities Service Gas Company, has been transferred from Seminole, Okla., to Burrton, Kans.

* * *

W. K. WHITEFORD, vice president in charge of production, Barnsdall Oil Company, Tulsa, was in Louisiana on company business during the first part of last week.

* * *

PAUL CONFER, a clerk in the Cunningham (Kansas) Field office of the Skelly Oil Company, lost a toe on his right foot in a hunting accident several days ago.

* * *

R. E. HAYLETT, of California, will speak before the Texas Academy of Science on "The New Process of Refining Lubricating Oil," at the University of Texas, November 16.

* * *

M. L. (JOE) NORRIS, at one time purchaser for the old Independent Oil & Gas Company, is now Mid-Continent sales representative of the Western Iron & Foundry Company of Wichita, Kans.

* * *

WILLIAM SCHWEMLEIN, chief engineer, the Parkersburg Rig & Reel Company, Parkersburg, W. Va., has been in Oklahoma and Kansas for the past 10 days and is now visiting company branches in Texas.

* * *

O. R. SEAGRAVES, prominent independent operator of San Antonio, Tex., is in the M. and S. Hospital of that city, recovering from a back injury, received in an automobile accident last week.

* * *

DR. A. VAN TIENHOVEN, of the Asiatic Petroleum Company at Caracas, Venezuela, accompanied by MRS. TIENHOVEN, were passengers on the Ile De France of the French line which left New York City, November 10 for European points.

* * *

E. B. REESER, president; R. A. BROOMFIELD, executive vice president; W. K. WHITEFORD, vice president, and other Barnsdall Oil Company officials made a detailed tour of properties in Kansas fields last week.

* * *

GEORGE T. HANSEN, president and general manager of the Utah Southern Oil Company, was in Casper, Wyo., the past week. His company is active in Texas and has under consideration the drilling of a test well on the Cisco anticline in Utah.

* * *

C. T. ERDMANN, of Denver, Colo., was in Casper, Wyo., the past week en route home after spending some time in western Montana working in conjunction with the State on Federal projects and dam sites. Mr. Erdmann is with the U. S. Geological Survey.

* * *

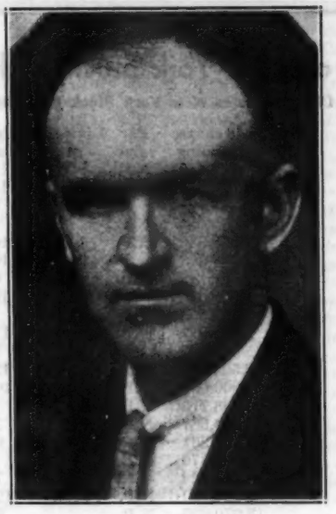
PHILIP R. CLARKE, president of the City National Bank & Trust Company of Chicago, has been elected a director of the Pure Oil Company, to fill the vacancy caused by the recent death of W. E. HUTTON, of Cincinnati, Ohio, one of the organizers of the company.

* * *

E. O. CREE, Mount Pleasant, Mich.; A. J. FAIRLEY, Black Run, Ohio; WILLIAM FREE, Wooster, Ohio; H. E. McFARLAND, Mount Pleasant, Mich.; E. E. MILLER, Robinson, Ill.; CHARLES SANDERS, Newark, Ohio; W. H. WATTERS, Mount Pleasant, Mich.; SAMUEL WELLS, Logan, Ohio, and HARRY E. WITTEKIND, Mount Pleasant, Mich., have been added to the Rig Building Practices Committee.

Helped Develop California Fields

Chase E. Sutton, general manager of the Gulf Coast producing division of the Pure Oil Company, has had a wide experience in the oil fields, including development and production work at Midway, Sunset, Elk Hills, Signal Hill, Huntington Beach and Montebello, in California.



CHASE E. SUTTON

Mr. Sutton entered the service of the Pure Oil Company in June, 1928, as a production engineer, starting as a production engineer at El Dorado, Ark., during the Champagnolle boom. He was transferred to Tulsa in December as division production engineer, and to Houston, Tex., in September, 1929, as manager of the Gulf Coast district. When the new Gulf Coast producing division was organized in 1932 Mr. Sutton became its general manager.

Mr. Sutton was born in Helena, Mont., in May, 1897, attended the public schools and the Polytechnic high school in Los Angeles, where the family then resided, later graduating from the University of California at Berkeley. At the age of 20 he got a job as an instrument man the civil engineering department of the Union Oil Company of California. He served as a naval engineer in the World War and following its close he entered the employ of the Interstate Oil Company and the Lakeview Oil Company as field engineer. In August, 1920, he obtained a leave of absence to go with the California State Mining Bureau as inspector and petroleum engineer, but in March of the next year he returned to the Interstate as production engineer in charge of field operations. He remained with this company until 1926, when he went to the U. S. Bureau of Mines as petroleum engineer in Dallas, Tex.

It was while he was with the Interstate that Mr. Sutton acquired his wide experience in California fields. While with the Bureau of Mines he completed reports on the Powell, Wortham and other fields, and prepared a report on geophysical prospecting for petroleum as of January, 1928.

In 1921 Mr. Sutton married Miss Vida L. Eakin. They reside in Houston and have one son.

E. H. GRISWOLD, Continental Oil Company, Fort Worth, Tex., and R. G. BECHTEL, Stanolind Oil & Gas Company, Midland, Tex., have been added to the New Mexico Production Committee.

* * *

ALFRED JOHN HAWORTH, student member of the Institution of Petroleum Technologists, has been awarded the Institution Scholarship tenable at the Imperial College of Science during 1934-35.

* * *

DR. A. E. DUNSTAN, F.I.C., chief chemist of the Anglo-Persian Oil Company, represented the Institution of Petroleum Technologists at the opening of the Maison de la Chimie and the fourteenth Congress of Industrial Chemistry held in Paris.

* * *

C. E. CRAWLEY, vice president for Consolidated Oil Corporation, of New York City, spent several days in Tulsa last week, and on Friday left with W. L. CONNELLY, chairman of the board; HENRY L. PHILLIPS, president; DANA H. KELSEY, vice president, and other officials of Sinclair Prairie Oil Company on an automobile tour of Oklahoma's active fields en route to Dallas, Tex., for the American Petroleum Institute convention.

* * *

EMPLOYES of the Tide Water Oil Company at Houston, Tex., were eating venison steaks the past week, which were passed around by D. E. LEGAN, production superintendent of the company after he had returned from a successful deer hunt, spent in the Guadalupe Mountains of New Mexico. He was accompanied on the trip by BILL BRANCH, R. I. WHITE, ARCH ROWAN, drilling contractor, and BILL COPELAND, all interested in Gulf Coast operations.

S. H. CATHCART, senior geologist in the Pennsylvania Geological Survey, is visiting in the Pennsylvania middle district oil-producing area preparatory to a structural mapping of this section by the state survey.

* * *

FRED H. PINKERTON, manager sales promotion, mechanical goods division, United States Rubber Products, Inc., New York City, accompanied by W. M. BALLEW, manager mechanical sales of the Kansas City office, are making a trip through the Mid-Continent oil fields.

* * *

GEORGE L. DUKE, field man for the Pennsylvania Grade Crude Oil Association in the New York State area, has been transferred to the headquarters offices in Oil City, Pa., where he will work with producers in the central district. He is now convalescing from an appendicitis operation.

* * *

K. R. TEIS, formerly district engineer with the Parkersburg Rig & Reel Company, Tulsa, has accepted a similar position with E. H. MOORE, oil producer with holdings in the Fitts Pool, Pontotoc County, Oklahoma. Mr. Teis will continue to make his headquarters in Tulsa for the time being.

* * *

R. E. DONAVAN, safety engineer of the Standard Oil Company of California, was a guest speaker at the meeting of the Los Angeles Chapter of the American Petroleum Institute which was held at Shell Hall in Long Beach, Calif., November 13. Other speakers were W. H. CREE and G. B. MOODY.

* * *

WILLIAM MOELLER, JR., vice president of Southern California Gas Company and in charge of natural gas production and transmission, was recently elected president of the Pacific Coast Gas Association at the forty-first annual meeting of the association. He also was honored at the sixteenth annual convention of the American Gas Association held in Atlantic City, N. J., by being elected vice president of the natural gas department.

* * *

FRITZ MARTIN, of Martin Drilling Company, is reported convalescent from an illness which kept him away from the office.

* * *

DON ROSS, who has been a seismologist on the Gulf Coast for the Barnsdall Oil Company, has returned to the land and geological department and is temporarily working out of Tulsa.

* * *

H. FOSTER BAIN, managing director of the Copper and Brass Research Association for the last three years, is retiring from that post at the end of November.

* * *

AUBREY W. SCHOFIELD, division production superintendent of the Lake Charles (Southwest Louisiana) area of the Gulf Refining Company, announces the enlargement of its quarters at Lake Charles with G. W. HOLLEYMAN as division land man; J. C. CABDEL, assistant superintendent; E. E. FERRIN, production engineer; JAMES GRAFTON, geologist, and others.

* * *

W. A. MONCRIEF, formerly of Ponca City, Okla., and now residing at Fort Worth, Tex., has been made president of the organization of oil operators in the new Sam Fordyce oil fields of Hidalgo County, in Southwest Texas. His associates are: B. H. KING, Mission, vice president, and PAUL J. ROGERS, Houston, secretary-treasurer, with these members of the executive committee: HERMAN F. HEEP, Houston; R. L. WHEELOCK, Corsicana; GUY GRAHAM, Houston; DICK HARRISON, Mission, and JOE BRIDWELL, Wichita Falls.

MARKET RECORD OF OIL SECURITIES

Active Oil Stocks Listed on New York Stock Exchange

Compiled by Carl H. Pforzheimer Co., 25 Broad Street, New York City, Members New York Stock Exchange and New York Curb Exchange

1934 High	1934 Low	Week ended Nov. 10 Sales	High	Low	Close	Stocks—	Total shares outstanding	Par value	Dividend rate	Payable or last paid	1933 High	1933 Low	1932 High	1932 Low	1931 High	1931 Low
55⅝	39	2,800	44½	42½	44½	Amerada Corp.	774,875	N.P.	50cQ	10-31-34	47⅝	18½	22¾	12	23	11¼
35¼	21½	8,000	25⅝	24⅝	25⅝	Atlantic Refining	2,673,834	$25	25cQ	12-15-34	32½	12⅜	21⅞	8⅝	23⅝	8⅝
10	5⅞	10,700	6⅝	6⅛	6½	Barnsdall Corp. A	2,248,795	$5	....	5-11-31	11	3	7	3⅜	14½	4
19¼	6⅞	14,600	8½	7⅞	8⅜	Columbia Gas & Elec.	11,610,036	N.P.	....	5-15-34	28⅛	9	21	4¼	45⅝	11⅝
14¼	7¼	22,000	8½	8	8½	Consolidated Oil Corp.	14,218,835	N.P.	14c	10-31-34	15¾	5	9	4	15⅞	4½
22¾	15¾	17,600	18¾	17⅛	18½	Continental Oil of Delaware	4,738,593	$5	25c	10-31-34	19⅝	4⅞	9⅜	3⅝	12	5
23½	12	9,600	18¼	16⅛	18	General Asphalt	387,149	$10	....	6-15-32	27	4⅝	15½	4⅜	47	9⅜
5⅝	2½	900	3	2⅞	3	Houston Oil (new)	1,098,618	$25	....	10-17-30	7⅜	1⅞	5⅜	1⅛	14⅛	3
3⅜	1	500	1¼	1⅛	1¼	Louisiana Oil Refining	1,302,158	N.P.	....	.....	4	⅝	2¼	½	4½	1
14¾	9⅛	2,400	11¼	10½	11¼	Mid-Continent Petroleum	1,857,912	N.P.	25c	11-15-34	16	3¾	8⅞	3⅜	16⅝	5
21⅛	10	1,900	12¼	10½	12¼	National Supply of Delaware	382,591	$25	....	5-15-31	28⅝	4	13	3½	10¼	5
15⅞	8½	6,500	10	9¼	9⅞	Ohio Oil Co.	6,563,107	N.P.	15c	12-15-34	17⅝	4¾	11	5	19½	5⅛
8⅞	5½	500	7	6¾	6⅞	Pacific Western Oil	1,000,000	N.P.	25c‡	10-25-33	9½	3	8	3	15	2⅞
2½	⅝	500	1	⅞	⅞	Panhandle P. & R.	198,770	N.P.	....	.....	4¼	⅜	1¼	¼	4¼	⅝
20¾	13⅜	12,000	15½	14¾	15½	Phillips Petroleum	4,154,687	N.P.	25c	12-1-34	18¾	4¾	8½	2	16⅝	4
16⅜	8	4,100	9	8¾	9	Plymouth Oil Co.	990,261	$5	25cQ	9-29-34	17⅝	6¾	12½	6	18	6
14⅞	6¼	9,500	7⅝	6½	7⅝	Pure Oil	3,038,370	N.P.	....	9-1-30	15⅜	2½	6½	2⅞	11⅞	3¼
39⅛	30⅜	500	31⅛	30⅜	31	Royal Dutch N. Y. shares	432,224	$14	$1.35	7-31-34	39¾	17⅝	23⅜	12⅛	42⅝	13
38⅜	20¾	5,400	26	25¼	25½	Seaboard Oil of Delaware	1,204,460	N.P.	15cQ§	12-15-34	43⅜	15	20⅜	6⅝	20¾	5⅓
11½	6	5,300	7	6⅜	6⅞	Shell Union Oil	13,070,625	N.P.	....	6-30-30	11⅝	4	8¾	2½	10¼	2½
89	57	800	68½	67	68	Shell Union Oil pfd.	400,000	$100	....	7-1-31	61	28½	65¼	18	78	15
15½	7¼	6,800	14⅞	14⅛	14⅝	Simms Petroleum	461,000	$10	30c	8-1-34	12⅜	4⅞	7½	3¼	11	3½
11½	6	500	7¼	7	7	Skelly Oil	1,008,514	$25	....	12-15-30	9⅞	3	5¾	2½	12⅞	2
19⅞	12½	25,800	14½	13¾	14½	Socony-Vacuum	31,019,694	$25	15cQ	12-15-34	17	6	12¼	5¼	21	8⅜
42⅞	26½	19,000	33¾	32½	33⅜	Standard Oil of California	13,102,900	N.P.	25c	12-15-34	45	19½	31⅞	15⅛	51¾	23¼
32¾	23¼	10,900	25	24¼	25	Standard Oil (Indiana)	15,941,894	$25	25cQ	12-15-34	34	17	25⅛	13⅜	38½	12½
41	27	100	27⅛	27⅛	27⅛	Standard Oil of Kansas	200,000	$10	50cQ	10-31-34	39⅞	12⅜	16½	7	19	7⅜
50⅛	39¼	20,500	43¼	41⅜	43¼	Standard Oil of New Jersey	25,740,065	$25	50cSA§	12-15-34	47½	22⅜	37⅜	19⅞	52½	26
72	51½	1,800	72	71⅞	72	Sun Oil	1,733,013	N.P.	25cQ†	12-15-34	59	35	39⅞	24⅜	45¼	26⅜
29⅜	19¾	9,800	22	21	22	Texas Corp.	9,486,417	$25	25cQ	10-1-34	30½	10⅜	18¼	9¼	36¼	9⅜
6½	2½	11,800	4⅛	3	4⅛	Texas Pacific Coal & Oil	880,703	$10	....	12-31-29	6½	1⅜	4	1½	6½	1⅞
14⅜	8	8,900	9½	9⅛	9½	Tide Water Associated	5,618,672	N.P.	....	2-16-31	11⅜	3½	5⅝	2	9	2¾
85⅛	64½	200	78	78	78	Tide Water Associated pfd.	666,524	$100	$1.50Q	10-10-34	65¼	23½	60	20	68	20½
20½	11½	4,100	15⅞	15½	15¾	Union Oil of California	4,386,070	$25	25cQ	11-10-34	23⅜	8½	15⅜	8	26⅝	11
21¼	15⅝	600	21	20⅝	21	Union Tank Car	1,200,000	N.P.	30cQ	12-1-34	22⅜	10½	19¼	11⅜	25¼	16
5¾	2½	1,500	3	2¾	2¾	Wilcox Oil & Gas	424,839	$5	....	5-10-28	5½	2	8¾	2¾	9⅜	2¾

*Ex-dividend. †Plus extras in common stock. ‡Initial dividend. §Plus extras.

Active Oil Stocks Listed on New York Curb

Compiled by Carl H. Pforzheimer Co., 25 Broad Street, New York City, Members New York Stock Exchange and New York Curb Exchange

1934 High	1934 Low	Week ended Nov. 10 Sales	High	Low	Close	Stocks—	Total shares outstanding	Par value	Dividend rate	Payable or last paid	1933 High	1933 Low	1932 High	1932 Low	1931 High	1931 Low
38	26	150	33	32½	32½	Buckeye Pipe Line Co.	200,000	$50	75cQ	12-15-34	39¾	25	35	17½	56	30
5½	2	4,000	2½	2	2½	Carib Syndicate	579,000	25c	....	.....	7⅜	⅛	¾	⅛	2⅜	⅛
126½	115	250	126¾	124	126¼	Chesebrough Mfg. Co.	120,000	$25	$1Q†	9-29-34	129	71	90	53	129½	75
4¼	1½	18,300	1¾	1½	1¾	Cities Service	37,804,394	N.P.	....	6-1-32	6¼	1½	6⅞	1¼	20¾	5
3¼	¾	1,900	⅞	¾	¾	Colon Oil	2,200,000	N.P.	....	.....	4	¼	1¼	¼	3½	¼
3⅞	1	600	1¼	1¼	1½	Cosden Oil	399,687	$1	....	.....	3⅞	1⅜	2⅞	¼	3¾	⅜
14⅜	9⅝	8,700	13⅜	12¾	13¼	Creole Petroleum	6,974,356	$5	....	.....	12	4¾	3½	1¾	3⅞	1⅜
7½	4¼	200	4½	4½	4½	Darby Petroleum	509,696	$5	25c	7-25-34	8	2½	7½	1⅝	2½	1⅜
2¼	1	No sales ..	..	..	..	Derby Oil & Refining	263,162	N.P.	....	.....	2¾	⅞	3	1	6	1½
37	30	100	33	32	33	Eureka Pipe Line	50,000	$100	$1Q	11-1-34	41¾	20	35	18	36	19
76¾	49¾	4,500	57¼	53	56½	Gulf Oil Corp.	4,538,101	$25	....	10-1-31	62	24	44¾	23	75½	25⅜
46¾	33¼	6,400	42⅝	39⅜	42¼	Humble Oil & Refining (new)	8,923,935	N.P.	25cQ	10-1-34	105½	40	55	35⅝	72	44½
17⅞	12⅝	22,600	17⅞	16½	17⅛	Imperial Oil of Canada	26,857,152	N.P.	25cSA†‡	12-1-34	15⅞	6½	10⅞	6¼	18¼	7⅜
6⅞	3⅜	No sales ..	..	..	..	Indiana Pipe Line	300,000	$10	15cSA†	11-15-34	8	3⅛	7½	2¾	21⅛	5½
33⅜	19⅜	27,900	33⅜	30½	32¼	International Petroleum	14,247,088	N.P.	56cSA†‡	12-1-34	23½	8⅞	12¼	8	15½	7⅜
4⅜	2⅛	11,100	4⅜	4	4⅜	Louisiana Land & Exp.	3,000,000	N.P.	....	.....	2¼	⅛	2½	½	2	½
5⅞	3½	No sales ..	..	..	..	Lion Oil Refining	270,000	N.P.	....	10-27-30	9½	1¼	3½	⅞	6¾	1½
8⅜	4¼	600	5½	5½	5½	Lone Star Gas	5,382,723	N.P.	16cQ§	3-31-34	11⅞	4¾	11	3⅜	29	5½
5½	4	400	4⅝	4⅝	4⅝	Mountain Producers	1,682,182	$10	15cQ	10-1-34	6½	2½	4⅜	2⅛	5⅞	2
18⅛	13¼	1,100	14⅛	13⅞	14	National Fuel Gas	3,810,183	N.P.	25cQ	10-15-34	20	10	14⅝	8	26½	9⅜
9½	7	300	7⅞	7⅞	7⅞	National Transit	509,000	$12.50	40cSA	6-15-34	10	5½	10½	6	17½	5
2½	1⅜	No sales ..	..	..	..	New Bradford Oil	1,445,202	$5	10c	9-15-34	2⅛	½	⅞	¼	1⅜	⅛
2¾	1	1,000	1⅜	1¼	1⅜	New Mexico and Arizona	1,000,000	$1	....	.....	1⅞	½	1¼	⅜	3	⅝
4¾	3	No sales ..	..	..	..	New York Transit	100,000	$5	15cSA	10-15-34	4⅞	3	9¾	7½	14½	5⅞
7	4⅝	100	5⅝	5⅝	5⅝	Northern Pipe Line	120,000	$10	25cSA	1-2-35	6⅛	4¼	5½	3½	35½	20
2⅝	⅞	3,600	1½	1⅜	1⅜	Pantepec Oil	1,608,700	N.P.	....	.....	3¾	⅛	⅝	1/16	2	⅜
3⅜	⅞	No sales ..	..	..	..	Ryan Consolidated	296,931	N.P.	....	.....	4¼	⅜	2⅛	⅜	3	⅜
7⅞	5½	1,300	6½	6	6⅛	Salt Creek Producers	1,496,859	$10	20cQ	11-1-34	9¼	3½	5½	2⅞	7⅝	2⅜
26½	17½	1,600	23	20½	22¼	South Penn Oil	1,200,000	$25	30cQ	9-29-34	22⅛	11	16½	9⅝	23⅞	9¾
5½	3⅝	100	3⅝	3⅝	3⅝	Southern Pipe Line	100,000	$10	15cSA	9-1-34	6	2⅛	10	3¾	17	7
47	41	No sales ..	..	..	..	Southwest Penna. Pipe Lines	35,000	$50	$1Q	10-1-34	43	24½	37	27	42½	25
17⅝	14⅝	3,900	16⅛	15⅜	16⅛	Standard Oil of Kentucky	2,606,983	$10	25cQ	9-15-34	19¼	8⅜	15⅞	8⅞	23⅝	12⅛
16⅞	8⅞	600	9	8¾	8¾	Standard Oil of Nebraska	190,822	$25	....	6-20-34	20½	11	19	10¼	36½	16
28½	12¼	1,500	13¼	12¾	13¼	Standard Oil of Ohio	753,740	$25	....	1-3-33	41	15½	30⅛	15½	62½	23
2	1/16	3,800	1⅛	1	1⅛	Sunray Oil	1,162,840	$5	....	4-15-31	1⅛	¼	⅝	⅛	5¼	⅛
11	4⅜	1,900	6¼	5¾	6	Texon Oil & Land	936,028	N.P.	15cQ†	9-29-34	13¾	6¼	10½	4½	12⅞	2¼

*Ex-dividend. †Plus extras. ‡Payable in Canadian funds. §Payable in preferred stock.

Note—In comparing highs and lows for the several years in the two tables, it will be necessary to take into consideration cases where there have been stock split-ups.

Production of Natural Gas in 1933 Same as 1932

(Continued from Page 165)

standstill in 1933, hence no new interstate movements were indicated in 1933.

INTERSTATE TRANSPORTATION AND EXPORTS OF NATURAL GAS IN 1933

Gas transported:	M cu. ft.
From Colorado to:	
Utah	1,411,000
Wyoming	271,000
	1,682,000
From Illinois to:	
Indiana	3,000
From Indiana to:	
Illinois	24,000
Kentucky	278,000
Ohio	1,000
	303,000
From Kansas to:	
Colorado	292,000
Illinois	974,000
Indiana	416,000
Iowa	6,536,000
Minnesota	2,338,000
Missouri	3,731,200
Nebraska	6,216,000
Oklahoma	599,000
South Dakota	566,000
	21,657,200
From Kentucky to:	
District of Columbia	1,702,000
Illinois	67,000
Indiana	515,000
Maryland	183,000
Ohio	4,264,000
Pennsylvania	10,100,000
Virginia	199,000
West Virginia	5,304,000
	22,334,000
From Louisiana to:	
Alabama	6,548,000
Arkansas	12,972,000
Georgia	4,101,000
Illinois	10,784,000
Mississippi	2,041,000
Missouri	5,279,000
Tennessee	7,321,000
Texas	33,628,000
	86,594,000
From Mississippi to:	
Alabama	962,000
Florida	494,000
Georgia	349,000
Louisiana	3,097,000
	4,902,000
From Missouri to:	
Illinois	178,000
Indiana	75,000
Kansas	200
	253,200
From Montana to:	
North Dakota	1,020,000
South Dakota	2,397,000
	3,417,000
From New Mexico to:	
Arizona	2,513,000
Colorado	112,000
Texas	3,556,000
	6,181,000
From New York to:	
Canada	29,000
Pennsylvania	1,000
	30,000
From Ohio to:	
Indiana	652,000
Kentucky	98,000
West Virginia	433,000
	1,183,000
From Oklahoma to:	
Arkansas	515,000
Kansas	11,598,000
Missouri	2,516,000
Nebraska	89,000
Texas	1,090,000
	15,808,000
From Pennsylvania to:	
Canada	40,000
District of Columbia	344,000
Maryland	112,000
New York	13,077,000
Ohio	834,000
Virginia	14,000
West Virginia	341,000
	14,762,000
From Texas to:	
Colorado	14,638,000
Illinois	19,766,000
Indiana	3,034,000
Iowa	4,832,000
Kansas	25,495,000
Louisiana	1,471,000
Mexico	2,039,000
Minnesota	1,209,000
Missouri	12,638,000
Nebraska	3,235,000
New Mexico	432,000
Oklahoma	11,944,000
South Dakota	291,000
Wyoming	352,000
	101,537,000
From West Virginia to:	
Kentucky	3,808,000
Maryland	272,000
Ohio	40,917,000
Pennsylvania	14,709,000
	59,798,000
From Wyoming to:	
Colorado	53,000
Montana	1,165,000
Nebraska	754,000
Utah	4,394,000
	6,366,000
	346,810,400

Central West Fields

(Continued from Page 150)

ing a test on the A. R. Smith farm, SW SW Section 28, same township and county.

In Grant County, W. M. Todd is drilling No. 1 on the W. and M. B. Jones farm, in the NW NW Section 23, Jefferson Township.

KENTUCKY

The best completions for the week in the Kentucky Field were the Cumberland Petroleum Co. and others' No. 14 on the Rolla Richards farm, in the Oak Station Pool, in Ohio County, which had an initial of 125 bbls.; and the Mecca Oil Co. and others' No. 4 on the J. T. Smith farm, in the same pool, which showed an initial of 125 bbls. Stewart & Geall's No. 10, on the E. C. Dunn farm, south of Fordsville, same county, produced 40 bbls. initial. J. C. Miller and others' No. 1 on the C. Lawhan farm, also in the same pool, had an initial of 40 bbls.

In the Roberts Pool, Mark-Bell & Co. found a dry hole in No. 10 on the Charles Wedding farm. Snowden-McSweeney's No. 1 on the Fred Midkiff farm, produced 25 bbls. initial. Charles E. Armstead and others' No. 5 on the Arnold Newlin farm, also in Ohio County, was a dry hole at 385 feet.

ILLINOIS

No completions were reported from the Illinois Field for the week.

Total runs made from wells served by the Illinois Pipe Line Co. in western Kentucky during the month of October were 148,225.11 bbls.

Eastern Fields

(Continued from Page 148)

feet on the James Mills farm and John Kingery and others are down 1,150 feet on the Rosa Midkiff farm. In Guyandotte district, R. H. Adkins and others have reached 1,000 feet on the J. G. Ramsey farm.

In Calhoun County, Sherman district, Godfrey L. Cabot, Inc., has made a location on the Henry Kight farm. McCall Drilling Co. has started drilling on the Hillery Vanney farm. I. B. Fowler and others are drilling in the Injun sand on the I. B. Fowler farm. Starcher and others have part of the material on the ground on the Graybill heirs farm. F. F. McIntosh is down 1,810 feet on the Seymore Settle farm. In Lee district, this operator has reached 1,815 feet on the E. L. Hays farm. South Eastern Oil & Gas Co. is building a rig for No. 4 on the John Slider farm. Jarvis and Ayers are down 2,280 feet on the Roanna Robinson farm. On the Ida M. McCoy farm, South Eastern Oil & Gas Co. is drilling No. 5 and has passed 1,000 feet. In Washington district Litton Gas Co. has started drilling on the Lubana J. Jarvis farm. In Center district, Park Bowser is drilling No. 9 on the Dora E. Ramsburg farm. Chemical Oil Co. is down 1,325 feet in No. 7 on the Taxwell Taylor farm.

In Gilmer County, A. E. Ellis and others are drilling at 1,750 feet on the Edward Reynolds farm, DeKalb district, a test. T. M. Cain and others are down 850 feet on the Harriet Gainer farm and McCall Drilling Co. 1,600 feet on the G. W. Wigner and others lease.

In Lincoln County, David Gas Co. has started drilling on the Alma Collins farm in Jefferson district. Lee Samson, trustee, is rigging up on the John M. Sias farm in Union district. In Lewis County, Freemans Creek district, McCall Drilling Co. is down 600 feet on the Jesse B. Wiseman farm.

In Ritchie County there is some new work. In Clay district, Pike Pool, Smith and Hendershot have made a location for No. 3 on the Charles Wilcox, Sr., lease. Ben Gilmore has made a location for No. 2 on the Frank Sheets Lot. H. N. Rinehart has made a location for No. 2 on the George Millbarger lease, 1,600 feet northwest of the center of the pool. In the Lost Run Pool district, Clay district, Richards Farm Oil Co. has started drilling No. 6 on the Corlie Ball farm, 1,550 feet east of the No. 5. In Grant district on the waters of Devil Hole Creek, Louther and Shuman have started drilling on the Rutherford heirs farm. On the right hand fork of Gillispie Creek in this district, E. C. Hartman and J. D. Elder have started drilling on the Ira M. Jackson farm. On Indian Creek in Murphy district, J. F. Deem is spudding on the C. J. Williamson No. 2 lease.

In Union district, Wood County, John Yeager and others have started drilling on the W. B. Wamsley farm, about 2,000 feet southwest of production on the A. F. Stagg farm. In Grant district, Pleasants County, Rachel Run Oil Co. has started drilling on the Evelyn Myers farm about 1,500 feet northeast of production on the Roberts Brothers lease on Cow Creek.

Canadian Fields

(Continued from Page 153)

immediate territory has been practically blanketed.

About two years ago Petroleum Engineering Co.'s No. 1 in Section 16-45-3w2, encountered a fair show of crude around 300 feet, and several shallow tests have since been undertaken for other interests.

Ontario Gas Tests

In Norfolk County, Ontario, E. P. Rowe's No. 5 Stilwell, in the Eden Field south of Tillsonburg, has got the gas sand and looks like a large producer. Several other tests in the Eden Field are drilling close to the sand.

In Haldimand County, Sovereign Gas & Oil Syndicate's No. 1 is drilling on acreage in Walpole Township about 1¾ miles west of Selkirk. The company holds three leases totaling 300 acres and has contracted its potential production to the Dominion Natural Gas Co. Aragain Gold & Natural Gas Syndicate's No. 7 is drilling. Lynn Valley Natural Gas Syndicate's No. 7 has finished as a fair gasser, and No. 8 has started.

In Moulton Township, Haldimand County, Lowbanks Drillers Gas Syndicate's No. 3 is below 350 feet. Location is 1,000 feet from No. 2 gasser. Smith & Ehde have the contract. Norhal Gas & Oil, Ltd., of Hamilton has finished two gassers in Walpole Township and is starting a test in Wainfleet Township, production being contracted to Dominion Natural Gas Co. at 25 cents per 1,000 feet. May Gold and Natural Gas Syndicate's No. 5 in Haldimand County, 1½ miles east of Canboro, is finishing.

In Walpole Township, Haldimand County, Empire Natural Gas, Ltd., is finishing No. 12; its output from 11 completed wells is over 2,000,000 feet a day. It has leased additional acreage in Norfolk County near Port Rowan and has contracted potential production in the Norfolk area to the Dominion Natural Gas Co. at 30 cents per 1,000 feet.

British Columbia Drilling

In the Flathead Valley of southeastern British Columbia, Columbia Oils, Ltd., of Vancouver has contracted with the Diamond Drill Contracting Co. of Spokane, Wash., to deepen its No. 1 well in the Sage Creek area to 4,000 feet. No. 1 has been standing at about 1,940 feet, with an oil horizon looked for at 2,700 feet.

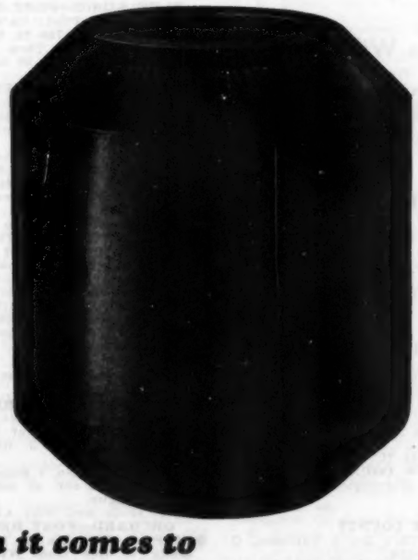
Michigan Fields

(Continued from Page 149)

southeast extension section of the old Muskegon Field.

Osceola County

Mellon Pollock Oil Co. failed to strike oil in the Dundee formation in No. 1 Elwyn Johnson, SW SE NE Section 1, Richmond Township, Osceola County, at



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more than 3,500 feet and may deepen. The Wittmer company is interested in the project.

The Johnson test is about a mile and a half southeast of the original wildcat test in Evart Township, Osceola County, by Sun Oil Co. in which a good show of oil was encountered after striking water in the Dundee.

Goll, Graves & Mechling are drilling at more than 3,000 feet in No. 1 William B. Richmond, SW NE SE Section 28, McKinley Township, Huron County.

Deep Tests

Two deep tests, one in Bethany Township, Gratiot County, and the other in Genoa Township, Livingston County, continued operations toward the Sylvania and Trenton formations, respectively.

Mid-States Oil Development Co.'s No. 1 W. L. Yost has reached about 4,300 feet in Bethany Township, while Herbert Snell and others have been shut down to install heavier power plant to continue from 5,017 feet to the Trenton expected at about 5,050 feet in No. 1 William F. Zeeb, NW SE Section 34, Genoa Township.

Two other wells are active in Gratiot County, Ithaca Oil & Gas Co.'s No. 1 Thum plugging back to test a show in the Traverse and McClanahan Oil Co.'s No. 1 Sullivan, NE SW NW Section 33, Pine River Township, drilling below 750 feet. Talbot Oil Co. lost the first hole, skidded rig and started over in its No. 1 McPherson Estate, NE NE NW Section 35, Howell Township, Livingston County test.

Shiawassee County

J. J. Keane & Son, of Detroit, has moved in to start a second Shiawassee County test on the Frank C. Hardy lease west of the village of Vernon. Same operators have reached 1,720 feet in the Owosso Oil & Gas Syndicate's No. 1 James H. Van Pelt, NW NW NE Section 35, Rush Township, Shiawassee County. Geosyn Oil Co., Inc., is drilling a third test in the county on the Hnevsa lease, NE NE NW Section 34, same township.

Kansas Wildcats

(Continued from Page 152)

RUSH COUNTY

Corbett, Barbour et al's No. 1 Schmidt, SW SW SE Sec. 16-17-16w.
Set 16-in. csg. 2,334 ft.; drlg. 2,547 ft.

Lario O. & G. Co. and Phillips Pet. Co.'s No. 1 Benbow, NW NE NE Sec. 12-17-19w.
Cellar.

RUSSELL COUNTY

Blair et al's No. 1 Fink, SW NW SE Sec. 16-14-14w.
Rigging up.

Eldorado Ref. Co.'s No. 1 Stratman, SW SE SE Sec. 32-14-11w.
H.F.W. 3,245 ft.; S.D. 3,250 ft.

Darby Pet. Co.'s No. 1 Jarus, NW SW NE Sec. 16-16-12w.
Drlg. 400 ft.

Lario O. & G. Co. et al's No. 1 Nuss, NW SW SW Sec. 11-16-14w.
Location.

Lario O. & G. Co. et al's No. 1 Moore, 760 ft. S and 660 ft. E, NW cor. Sec. 34-13-13w.
Location.

Tom Palmer et al's No. 1 Herbel, NW SW Sec. 4-13-11w.
Set 8-in. csg. 2,743 ft.; drlg. 2,745 ft.

SALINE COUNTY

Dieter et al's No. 1 Herrington, NE NW SE Sec. 3-13-1w.
Drlg. 1,565 ft.

SCOTT COUNTY

Atlantic Oil Prod. Co.'s No. 1 Vaniman, C SE NE Sec. 15-20-33w.
H.F.W. 4,130-40 ft.; drlg. 4,334 ft.

SEDGWICK COUNTY

Aladdin Pet. Co. et al's No. 1 D. Lauck, SE NE NW Sec. 21-28-2.
Rig.

Allison & Fitswilliams et al's No. 1 Struthers, NE SW Sec. 24-28-2w.
Set 10-in. csg. 2,390 ft.; C.O.

Leo Keller et al's No. 1 Russell, SW SW NW Sec. 16-29-2.
Cellar.

D. R. Lauck et al's No. 1 Roy, SE SW Sec. 20-29-1w.
U.R. 6-in. csg. to 3,441 ft.

Syndicate O. & G. Co. et al's No. 1 Ratzlaff, NE NW NW Sec. 30-26-2.
Drlg. 2,285 ft.

STAFFORD COUNTY

Atlantic Oil Prod. Co. and Phillips Pet. Co.'s No. 1 Guthrie, C NW NW Sec. 15-25-11w.
Rigged up.

SUMNER COUNTY

Wentz et al's No. 1 Horsley, CSL SW SW SW Sec. 18-35-1.
Set 8-in. csg. 3,188 ft.; R.U. standard tools.

TREGO COUNTY

Marathon Oil Co.'s No. 1 Kline, SW SE Sec. 19-14-24w.
Set 6-in. csg. 4,378 ft.; drlg. 4,471 ft.

WASHINGTON COUNTY

Rose Oil Co. et al's No. 1 Penwell, NE NW SE NE Sec. 16-3-3 (O.W.D.D.).
Old T.D. 1,720 ft.; R.U. and S.D.

WOODSON COUNTY

Schwartz et al's No. 1 Collins, SW NW NE Sec. 30-23-14.
Drlg. 610 ft.

Gulf Coast Wildcats

(Continued from Page 146)

190 ft. S N line, 150 ft. W of No. 9, Henry Griffith league.
Comp.; no gauge; T.D. 4,361 ft.

Moody Corp.'s No. 1-C E. W. Barber, 302 ft. from N line and 312 ft. from E line of "B" lease, H. Griffith Sur.
Drlg. gumbo 1,195 ft.

Humble O. & R. Co.'s No. 7-B Kirby, 200 ft. W of No. 6 in Henry Griffith league.
10¾-in. csg. at 1,532 ft.; drlg. salt 2,291 ft.

Sun Oil Co.'s No. 6 Higgins, 302 ft. W of E line and 432 ft. N of S line of lease.
Drlg. shale 5,641 ft.

Sun Oil Co.'s No. 10 Chambers, 50 ft. from N and W lines of lease.
Fishing 3,658 ft.

Sun Oil Co.'s No. 17 Wilburn fee, 188 ft. E of W line and 40 ft. S of N line and 130 ft. W of No. 16.
Derrick.

Sun Oil Co.'s No. 22 J. Wilburn, midway between wells No. 17 and 21, or 150 ft. from each well.
Drlg. 3,257 ft.

Texas Gulf Prod. Co.'s No. 4-B E. W. Barber, 75 ft. S of Moody Corp.'s No. 6-A Barber and 75 ft. from SW line of 35-ac. lease, H. Griffith Sur.
8¾-in. csg. 3,325 ft.

Texas Gulf Prod. Co.'s No. 5 J. F. Wilburn, 110 ft. W of No. 3 and 50 ft. N of S line of lease, Wm. Hodge Sur.
9⅝-in. csg. 4,160 ft.; comp.; no gauge.

Texas Gulf Prod. Co.'s No. 3 O. W. Wilfree, 595 ft. S of N line and 50 ft. W of E line of lease.
Drlg. streaks of lime 4,910 ft.

Yount Lee Oil Co.'s No. 25 Chambers County, 75 ft. S. 50 ft. W of NE cor. of lease.
Top Big lime 4,433 ft.; drlg. 4,446 ft.

Yount Lee Oil Co.'s No. 27 Chambers Co., 400 ft. W of No. 24 and in line with Nos. 24 and 21.
Derrick.

Yount Lee Oil Co.'s No. 28 Chambers County, 50 ft. N S line, direct offset to Sun's No. 10 Chambers County, Wm. Bloodgood Sur.
Derrick.

Yount Lee Oil Co.'s No. 9 Phillips, 100 ft W of No. 8.
Cmtd. 7⅝-in. csg. 3,719 ft.; comp.; I.P. 220 bbls. per hr.; 185 lbs. pressure.

BLUE RIDGE—FORT BEND COUNTY

Mills Bennett Prod. Co.'s No. 2 Luscher, 1,950 ft. S and 750 ft. E of westerly NW cor. 500-ac. tract. Thos. Hebermaches Sur.
T.D. 4,453 ft.; I.P. 50 bbls. per hr.; 40% wash wtr.

BOLING—FORT BEND COUNTY

Allied Minerals, Inc.'s No. 1 J. H. Blackwell, 1,400 ft. from E line, 100 ft. from S line of 50-ac. of J. H. Blackwell 100 ac., John Huff Sur.
Drlg. sand and boulders 2,030 ft.

Midland Oil Co.'s No. 1 P. F. Coulter, 150 ft. from S line, 4,174 ft. from W line of 100-ac. tract, Miller League No. 2.
Drlg. shale 3,476 ft.

Allied Minerals, Inc.'s No. 1 E. C. Farmer, James Scott League, 750 ft. SE of NW line and 150 ft. SW of NE line of Gulf Prod. Co.'s E. C. Farmer 50-ac. tract.
Drlg. shale and lime 3,378 ft.

Allied Minerals, Inc.'s No. 1 J. R. Farmer, 150 ft. out of most southerly 50-ac. tract, James Scott Sur. (workover).
T.D. 4,361 ft.; drlg. plug.

Irwin Larsen et al's No. 1 J. R. Farmer, 100 ft. NW and 100 ft. SW from E cor. of 125-acre lease, James Scott Sur.
Location.

THOMPSON—FORT BEND COUNTY

Humble O. & R. Co.'s No. 30 Lockwood & Sharpe, 4,296 ft. W of E line, 293 ft. S of N line of lease, J. Rabb Sur.
Drlg. 5,410 ft.

Gulf Prod. Co.'s No. 9 Gubels, 450 ft. N, 475 ft. W of SE cor. of lease, Samuel Kennedy League.
Drlg. shale and lime 4,167 ft.

ORCHARD—FORT BEND COUNTY

Gulf Prod. Co.'s No. 41 Moore, 2,873 ft. S along W line from NW cor. of James Frazier Sur., and 3,154 ft. at R/A.
Drlg. sand 4,105 ft.

HIGH ISLAND—GALVESTON COUNTY

Yount Lee Oil Co.'s No. 42 Cads. N. Fitzsimmons Sur., half way between Nos. 36 and 38 and 150 ft. E at right angles.
Rig up.

Yount Lee Oil Co.'s No. 22 Smith.
No report.

Yount Lee Oil Co.'s No. 1 Mace Stewart, Martin Dunman Sur.
Comp.; T.D. 4,237 ft.; I.P. 425 bbls.; ¼-in. choke.

BATSON—HARDIN COUNTY

John A. Deering et al's No. 1 Hooks, Willis Donoho Sur., S extension test.
Comp.; T.D. 4,954 ft.; I.P. 125 bbls. daily.

ARRIOLA—HARDIN COUNTY

Houston Oil Co.'s No. 4-X Arriola fee, 400 ft. E of No. 3-X.
Coring shale 4,130 ft.

SARATOGA—HARDIN COUNTY

Rio Bravo Oil Co.'s No. 5 R. Jordit, 60 ft. W. 495 ft. S of NE cor. of Jordit tract.
T.D. 1,229 ft.; I.P. 35 bbls. per day.

Mines Bros.' No. 1 Coswell.
Swabbing; T.D. 5,332 ft.

SOUR LAKE—HARDIN COUNTY

Alpha Pet. Co.'s No. 2 Weiss, E flank of dome.
T.D. 5,644 ft.; D.S. stuck.

Sun Oil Co.'s No. 3 Bernard Corp., 150 ft. from N and W lines of Lot 11, H.T.&B. Sur., Sec. 69.
Coring 6,911 ft.

Texas Co.'s No. 313 fee, 150 ft. S and 250 ft. E of No. 308 fee.
Cmtd. 10-in. csg. at 645 ft.; 7-in. csg. at 1,575 ft.; T.D. 1,939 ft.; P.B. 1,594 ft.

GOOSE CREEK—HARRIS COUNTY

Kerring's No. 1 Williams, 180 ft. from SE cor. and 55 ft. NE of Hybush's No. 3, in W. Scott upper league.
Cellar.

Humble O. & R. Co.'s No. 80 Simms-Smith, Scott Lower League, 1,000 ft. E of the most westerly W line, and 300 ft. N of the most northerly S line.
Drlg. shale 6,288 ft.

PIERCE JUNCTION—HARRIS COUNTY

A. & P. Prod. Co.'s No. 3 Whitehead, 150 ft. S of No. 5; 50 ft. from E line of lease, J. Hamilton Sur.
Abd.; salt 3,252 ft.

Gulf Prod. Co.'s No. 10 H. C. Cain, 399 ft. S and 290 ft. E of NW cor. of lease and 217 ft. N of No. 9, J. Hamilton Sur No. 879 (workover).
T.D. 5,873 ft.; D.S. stuck.

Rio Bravo Oil Co.'s No. 27-A Settegast, 277 ft. S. 553 ft. W of NE cor. of Settegast "A" tract, James Hamilton Sur.
Moving in rig.

Rio Bravo Oil Corp.'s No. 9-A Settegast, 1,575 ft. N line, 350 ft. E line NE cor. "A" lease, J. A. Kopman Sur.
T.D. 4,486 ft.; set whipstock 4,292 ft.; milling out to sidetrack.

MYKAWA—HARRIS COUNTY

Danciger O. & R. Co.'s No. 1 Williams, SW cor. of 29-ac. lease.
Derrick.

Danciger Oil & Ref. Co.'s No. 2 Minnetex, 150 ft. of N line and 85.9 ft. of E line of lease, Lot 253, Wm. Lovett Sur.
T.D. 4,859 ft.; I.P. 300 bbls. per day.

West Prod. Co.'s No. 1 Lobit, C of Lot 17, Erin Gardens Subd., F. J. Rothaas Sur.
No report.

TOMBALL—HARRIS COUNTY

Amerada Pet. Corp.'s No. 2 Metzler, 466 ft. out of NW cor., Joseph House Sur.
T.D. 5,606 ft.; comp.; 1,872,000 ft. of gas per day; ¼-in. choke; tubing pressure 2,000 lbs.; csg. pressure 2,150 lbs.

Amerada Pet. Corp.'s No. 3 Fitz-Rudel, 466 ft. from E line, 500 ft. from S line of 80-ac. lease, Joseph House Sur.
T.D. 5,585 ft.; brown shale; W.O.C.

Humble Oil & Ref. Co.'s No. 5-B Hope, 1,900 ft. from S line and 466 ft. from W line of "B" lease, A. Senchall Sur., Abst. 722.
Location.

Humble O. & R. Co.'s No. 2 Koba, 1,061 ft. S from N line, 623 ft. E of W line of 105-ac. tract, J. M. Hooper Sur.
Comp.; T.D. 5,569 ft.; I.P. 32 bbls. per hr.; ¼-in. choke.

Texas Co.'s No. 2 Albert Ziegler, 466 ft. E and 466 ft. N of SW cor. of lease, Wm. Hurd Sur.
Drlg. shale and lime 4,157 ft.

KITTRELL-HOUSTON AND WALKER COUNTIES

Boone Bros.' No. 1-A Texas Ling Leaf Co., 330 ft. from N and W lines of Texas Long Leaf Lbr. Co.'s 379-acre tract, Geo. Keilman Sur.
Abd. 2,526 ft.

Crown Central Pet. Corp.'s No. 1 Texas Long Leaf Lbr. Co. and Thompson Bros., 150 ft. from W line, 150 ft. from N line of 40-ac. tract in J. S. Estheridge Sur., Abst. 395.
Location.

Humble O. & R. Co.'s No. 2 Shaw, 330 ft. from SE line of lease and 660 ft. SW of No. 1 Charles McEllis Sur.
Drlg. shale 1,618 ft.

Humble O. & R. Co.'s No. 1 Texas Long Leaf Lbr. Co., 330 ft. from SW line and 330 ft. from SE line of Texas Long Leaf Lbr. Co., 696-ac. tract, C. C. McEllis Sur.
Drlg. shale 3,735 ft.

Humble O. & R. Co.'s No. 2 Texas Long Leaf Lbr. Co., 330 ft. SW of NE line, 660 ft. SE of No. 3, Chas. McEllis Sur., Abst. 382.
Location.

Humble O. & R. Co.'s No. 3 Texas Long Leaf Lbr. Co., 330 ft. SE of NW line, 330 ft. SW of NE line, and 660 ft. NW of No. 2, Chas. McEllis Sur.
Location.

Trinity Dev. Co.'s No. 1 G. A. Knox, 1,000 ft. from SE line and 500 ft. from SW line of Wm. Prissick Sur.
No report.

VANDERBILT—JACKSON COUNTY

Imperator Oil Co.'s No. 1 Dutton, S C of Lot No. 11, Blk. 25, 450 ft. S of R.R. and 1,350 ft. W line of townsite, Ray Musquis Sur.
Rigged up and S.D.

Turman Oil Co.'s No. 1 T. H. Miller, 150 ft. each way out of E 50-ac. of Miller 100-ac. tract in Ray Musquis Sur.
Rig up.

BIG HILL—JEFFERSON COUNTY

Yount Lee Oil Co.'s No. 1-A Pipkin, 2,640 ft. S and 2,050 ft. W of NE cor. of survey.
Drlg. shale 2,500 ft.

FANNETT—JEFFERSON COUNTY

Gulf Prod. Co.'s No. 15 Thomas, 200 ft. W of Gulf's No. 7 Burrell.
Drlg. sand 2,679 ft.

CLEVELAND—LIBERTY COUNTY

Gulf Prod. Co.'s No. 7 Kirby, 1,100 ft. N of No. 6-C Kirby.
Location.

Gulf Prod. Co.'s No. 1 R. D. McDonald, 2,796 ft. N and 185 ft. W of most southern SE cor. of Tom Devers Sur., Abst. 176, W offset to No. 6-C Kirby.
Temp. abd. location.

ESPERSON—LIBERTY COUNTY

General Crude Oil Co.'s No. 14 Moores Bluff 1,675 ft. S, 10 deg. 3 min. E of No. 10.
T.D. 4,495 ft.; reaming down 3,932 ft.

General Crude Oil Co.'s No. 9 Davis, 1,320 ft. each way from S and E lines of lease in D. Kokernut Sur.
Drlg. wtr. sand 5,567 ft.

General Crude Oil Co.'s No. 1 W. D. Kay, Malcom Duncan Sur., 1,537 ft. along S line from NE cor., 560 ft. S at R/A.
Drlg. sandy shale 2,243 ft.

HANKAMER—LIBERTY COUNTY

Gulf Prod. Co.'s No. 3 Crow & Jacobs, 300 ft. each way out of SW cor. of survey, H.&T.C. Sur., A 353.
Drlg. sand 2,694 ft.

HULL—LIBERTY COUNTY

Gulf Prod. Co.'s No. 12 W. L. Thomas, 1,650 ft. N and 150 ft. E of SE cor. of 300-ac. tract, Jessie Devore Sur.
Drlg. sticky shale 4,757 ft.

G. R. Brown and S. F. Bashara's No. 1 David Hannah, Jesse Devore league, 100 ft. S line, 150 ft. E line, 42-ac. Gulf tract.
Derrick.

BUCKEYE—MATAGORDA COUNTY

United North & South Dev. Co.'s No. 1 Unit 4, Buckeye farm, J. C. Keller league, 214 ft. N line and 203 ft. E line of lease.
Cutting and pulling screen; T.D. 7,881 ft.

United North & South Dev. Co.'s No. 1 Pletner, 1,210 ft. SE No. 1 Stoddard and 130 ft. W of right of way S.T.L.&B.M.Ry. Sur.
Abd.; tested S.W.; T.D. 7,910 ft.

United North & South Dev. Co.'s No. 1 Unit No. 58, 250 ft. N and 200 ft. W of SE cor. of Unit No. 58.
Abd.; tested S.W.; T.D. 7,955 ft.

MARKHAM—MATAGORDA COUNTY

Hawkins Oil Co.'s No. 1 Hawks fee, 1,850 ft. from N line and 1,650 ft. from E line of 20-ac. lease.
T.D. 600 ft.; derrick down.

Powers Prod. Co.'s No. 4 Myers, in line with wells Nos. 1 and 2, being 250 ft. E of No. 2.
Derrick down.

CONROE—MONTGOMERY COUNTY

George W. Strake's No. 2 Schaffe, 300 ft. from E line, 467 ft. from S line, C. B Stewart Sur.
T.D. 5,066 ft.; I.P. 25 bbls. per hr.; comp.

SPLENDORA—MONTGOMERY COUNTY

Bryce McCandless et al's No. 1 Texas Long Leaf Lbr. Co., 330 ft. from N and E lines of the W½ of Blk. No. 8, Walker County School Land Sur.
Bldg. derrick.

ORANGE—ORANGE COUNTY

Trio Oil Co.'s No. 1 D. S. Comier, 69 ft. W of E line and 39 ft. S of N line of 6.83-ac. tract in W. M. Dyson Sur.
Prepare to spud.

PORT NECHES—ORANGE COUNTY

Port Neches Pet. Corp. et al's No. 1 W. R. Organ, 450 ft. from NE line and 150 ft. from NW line of A. Schramm Sur., 8 of Port Neches Field.
Location.

Texas Co.'s No. 6 Kuhn, 150 ft. E, 150 ft. N of SE cor. of Mary Hall Sur.
10-in. 2,000 ft.; drlg. sand 3,940 ft.

Texas Co.'s No. 8 Kuhn, 1,320 ft. N and 250 ft. E of SE cor. of Mary E. Hall Sur. No. 2 in T. J. Notgress Sur.
Washing; T.D. 7,149 ft.

Texas Co.'s No. 9 Kuhn, 990 ft. N and W of SE cor. of Mary E. Hall Sur. No. 2.
Drlg. shale 7,175 ft.

LIVINGSTON—POLK COUNTY

T. D. Humphries' No. 1 J. C. Whitforth, Block H.
Derrick.

B. M. York et al's No. 1 Kingsbury County Holding Corp., 750 ft. SE of J. Z. Werby et al's No. 1 Dick and Failing.
Prepare to test; T.D. 4,346 ft.

GRETA—REFUGIO COUNTY

Atlantic and Stanolind's No. 7-G O'Brien.
Derrick.

Hewitt & Daugherty's No. 12 Lambert.
Rig up.

Humble Oil & Ref. Co.'s No. 9 Fannie Heard, 933 ft. E of No. 7, 1,150 ft. S of No. 8.
Cmtd. csg. 4,287 ft.; T.D. 4,000 ft.

United Prod. Co.'s No. 10 Fannie Heard, SE cor. of lease; workover.
T.D. 3,627 ft.; P.B. to 3,566 ft.; mixed mud and circulating.

United Prod. Co.'s No. 13 M. F. Lambert, C of N½ of Blk. 15 of the M. F. Lambert Subd.
W.O.C. 1,205 ft.

United Prod. Co.'s No. 14 M. F. Lambert, C of S½ of Blk. 6, of M. F. Lambert Subd.
W.O.C. 1,210 ft.

United Prod. Co.'s No. 15 M. F. Lambert, C of S½ of Blk. 15 of M. F. Lambert Subd.
Drlg. sticky shale 1,216 ft.

REFUGIO—REFUGIO COUNTY

Houston Oil Co.'s No. 1 Johnson, center of Blk. 63; (workover).
S.D. 5,140 ft.

Houston Oil Co.'s No. 17 W. J. J. Heard, 660 ft. SE of No. 16 W. J. J. Heard.
Drlg. hard sand with soft streaks 3,630 ft.

Houston Oil Co.'s No. 17 Rooke, 600 ft. SW of No. 16 Rooke.
Drlg. shale and lime 2,695 ft.

Humble O. & R. Co.'s No. 15 J. F. B. Heard.
Drlg. shale 4,330 ft.

United Prod. Co.'s No. 8 J. A. Lambert, 933 ft. N of NW cor. of W. Heard tract and 150 ft. W of tract line, L. M. Rogers Sur.
T.D. 4,095 ft.; drilled plugs; perforated csg. 6,075-95 ft.; set screen and liner; made S.W.; csg. pressure 250 lbs. shut in.

COLETO CREEK—VICTORIA COUNTY

Rupert Cox's No. 1 Antone Trybil, R. Manchola Sur.
Derrick.

Albert Plummer's No. 3 Terrell, 693 ft. from NW line, 330 ft. NE line of 57-ac. tract, Manchola Sur.
No report.

Albert Plummer's No. 1 Zimmer, 330 ft. NE and SE lines of lease in Manchola Sur.
No report.

McFADDIN-O'CONNOR DISTRICTS—VICTORIA AND REFUGIO COUNTIES

Humble O. & R. Co.'s No. 17 O'Connor, 983 ft. SW of No. 15, Keating Sur.
Drlg. shale 3,400 ft.
Gumble Oil & Ref. Co.'s No. 2 McFaddin C. O. Edwards Sur.
Drlg. shale 3,928 ft.
Texas Co.'s No. 3 McFaddin, 9,150 ft. S and 300 ft. at R/A out of NW cor. of C. M B. Hoyt Sur.
5-in. csg. 6,130 ft.; T.D. 6,230 ft.
Texas Co.'s No. 9 McFaddin.
Location.

SAN FELIPE—WALLER COUNTY

DeArman Bros.' No. 1 Smith, 150 ft. from SW line, 150 ft. from SE line of 30-ac. tract, John McFarland Sur.
Tested wtr. from 2,872-99 ft.; to drill ahead.
Seaport Oil Co.'s No. 1 J. W. Avery, 330 ft. from E line, 330 ft. from N line of NE cor. of 29-ac. tract, John McFarland Sur.
Drlg. shale 2,110 ft.

CLAY CREEK—WASHINGTON COUNTY

Sun Oil Co.'s No. 3 R. L. Landry.
Rig up.
Sun Oil Co.'s No. 11 Janner.
Comp.; T.D. 1,270 ft.; I.P. 20 bbls. hrly.

LOUISE—WHARTON COUNTY

Pure Oil Co.'s No. 1 John Machs, 318 ft. from NW line and from SE line of F. Walnut Sur., and 467 ft. from NE line of 161.53-ac. lease, M.&C. Sur. No. 25.
Location.
Pure Oil Co.'s No. 1 G. F. Wharton Est., 1,497 ft. from SW line and 318 ft. from SE line of F. Walnut Sur., Abst. A-35.
Location.
Pure Oil Co.'s No. 2 Garrett, 990 ft. from NW and 330 ft. from NE of S cor. Sec. 38, T. W. Heard Sur.
Running 7-in. csg. 5,150 ft.
Pure Oil Co.'s No. 2 Stewart, Morris & Cummings Sur., Sec. 25, 990 ft. out of SW cor. of 160 acres.
T.D. 8,271 ft.; moving in 7-in. csg.

SOUTH LOUISIANA FIELDS
BLACK BAYOU—CAMERON PARISH

Brownie Babbette Oil Co.'s No. 1 R. A. Moore, 562 ft. W, 50 ft. S of NE cor. of E½ of SE Sec. 18-12s-12w.
Swabbed S.W. and S.D.; T.D. 6,298 ft.
Shell Pet. Corp.'s No. 3 State.
Coring shale 6,499 ft.
Shell Pet. Corp.'s No. 20 Watkins, 1,611 ft. S and 216 ft. W of NE cor. Sec. 18-2s-12w.
Coring shale 3,909 ft.

BOSCO—ACADIA AND ST. LANDRY PARISHES

Superior Oil Prod. Co.'s No. 3 Arceneaux, 1,948 ft. S and 1,708 ft. W of NE cor. of Sec. 33-8s-3e.
Drlg. sandy shale 7,676 ft.
Superior Oil Prod. Co.'s No. 1 Herbert, 2,-095 ft. S and 2,058 ft. E of NW cor. Sec. 35-8s-3e.
Derrick.
Superior Oil Prod. Co.'s No. 5 Larcade, 1,-665 ft. S and 483 ft. E of NW cor. Sec. 35-8s-3e.
Derrick.
Superior Oil Prod. Co.'s No. 2 Comeaux, 1,-876 ft. S and 467 ft. W of NE cor. Sec 34-8s-3e.
Drlg. sand and shale 3,790 ft.
Superior Oil Prod. Co.'s No. 3 Iseringhauser, 1,817 ft. E, 330 ft. N of SW cor. Sec. 27. Derrick.
Superior Oil Prod. Co.'s No. 1 Malancon, 375 ft. S and 63 ft. E of NW cor. SW Sec. 34-8s-3e.
Drlg. sand 3,946 ft.
Superior Oil Co.'s No. 2 Larcade, 582 ft. N and 1,197 ft. E, SW cor. Sec. 26-8s-3e.
Cored sand and shale 3,439 ft.
Superior Oil Co.'s No. 4 Larcade, 658 ft. S and 2,292 ft. E from NW cor. of Sec. 35-8s-3e.
Drlg. sticky shale 4,400 ft.
Superior Oil Prod. Cor.'s No. 1 Lucien Lavergne, 596 ft. E and 330 ft. N of SW cor. of Sec. 27-8s-3e.
T.D. 8,736 ft.; P.B. 7,000 ft.; crooked hole.
Superior Oil Prod. Co.'s No. 1 Moise Lavergne, 269.7 ft. W and 98 ft. N. of SE cor. of Sec. 28-8s-3e.
Derrick.
Superior Oil Prod. Co.'s No. 1 Trahan, 1,-892 ft. N, 543 ft. W of SE cor. Sec. 27. Comp.; no gauge; T.D. 7,849 ft.
Superior Oil Prod. Co.'s No. 3 Hermandes, 529 ft. from S line, 669 ft. W of NE cor. NW Sec. 34-8s-3e.
Drlg. sand 7,719 ft.
Superior Oil Prod. Co.'s No. 2 Iseringhauser, 839 ft. from W line, 330 ft. from N line of 31.85-ac. tract, Sec. 35-8s-3e.
7-in. csg. 8,642 ft.; running tubing; T.D. 8,664 ft.
Superior Oil Prod. Co.'s No. 3 Larcade, 542 ft. E and 500 ft. N. SW cor. Sec. 26-8s-3e.
9⅝-in. 7,830 ft.; T.D. 8,846 ft.; I.P. 650 bbls.; 14/64-in. choke; 1,400 lbs. csg. pressure; 1,300 lbs. tubing pressure.

CAMERON MEADOWS—CAMERON PAR.

Burton-Sutton's No. 1 School Land.
Drlg. rock 3,869 ft.
Burton-Sutton Oil Co.'s No. 4 School Land 2,891 ft. W and 150 N of SE cor. of Sec 16-4s-13w.
Derrick.
Texas Co.'s No. 1 Miami Corp.
Reaming; T.D. 7,620 ft.

EDGERLY—CALCASIEU PARISH

Edgerly Oil Co.'s No. 2 Bright-Penn, 300 ft. S and 150 ft. W of NE cor. Sec. 28-9s-11w.
Drlg. sand 3,707 ft.
Emerson Oil Co.'s No. 1 Bright-Penn.
No report.
Emerson Oil Co.'s No. 2 Yount Lee, 300 ft. S, 150 ft. W of NW cor. NE cor. SW Sec. 28-9s-8w.
Location.

STARKS—CALCASIEU PARISH

Gulf Prod. Co.'s No. 36 Lutcher-Moore, 1,-466 ft. S and 1,316 ft. E of NW cor. Sec. 19-9s-12w.
Drlg. shale 2,459 ft.

DOG LAKE—TERREBONNE PARISH

Texas Co.'s No. 11 State, 150 ft. N and 2,474 ft. W, SE cor. Sec. 31-21s-16e.
Building derrick.
Texas Co.'s No. 15 State, 2,602 ft. N and 1,308 ft. W, SE cor. Sec. 31-21s-16e.
Drlg. shale 4,429 ft.

GUEYDAN—VERMILLION PARISH

Pure Oil Co.'s No. 6, Alliance Trust, 667 ft. E, 1,787 ft. S line of lease, Sec. 34-11s-1w.
Fishing 9,379 ft.

HACKBERRY—CAMERON PARISH

Gulf Prod. Co.'s No. 16 Irwin, 770 ft. from N line, 990 ft. from W line, SE cor. Sec. 12-12w-10s.
Rig up.
Texas Co.'s No. 13-B State, 400 ft. N of NE cor. of lease, Sec. 13-12s-10w.
12-in. csg. 2,079 ft.; drlg. 3,954 ft.
Texas Co.'s No. 14 State, 500 ft. SE of No. 12, Sec. 13-12s-10w.
Location.
Union Sulphur Co.'s No. 1 Barbee est., 1,720 ft. N line, 320 ft. E of SW cor. Sec. 13-12s-10w.
Drlg. sandy shale 5,871 ft.
Union Sulphur Co.'s No. 9 Humble, 300 ft. E and slightly N of No. 1 well, or 830 ft. N and 370 ft. E of the SW cor. of Sec. 12-12s-10w.
Abd. 5,661 ft.
Union Sulphur Co.'s No. 4 Humble, 710 ft. N and 830 ft. W of SE cor. Sec. 11-12s-10w.
Drlg. sticky shale 4,765 ft.
Yount Yee Oil Co.'s No. 1-A Gulf Land, 2,000 ft. S and 50 ft. E of the NW cor. of Sec. 22-12-10.
Rig up.
Yount Lee Oil Co.'s No. 4 Carter, 160 ft. S, 305 ft. W of NE cor. of 30-ac. lease. Sec. 22-12s-10w.
Drlg. sand 1,652 ft.
Yount Lee Oil Co.'s No. 2-A Gulf Land. 1,100 ft. S and 50 ft. E of the NW cor. of Sec. 21-12-10.
Rig up.
Yount Lee Oil Co.'s No. 15-A Gulf Land, 1,160 ft. S and 715 ft. W of the NE cor. of the SW of Section 16-12-10.
Drlg. sand 4,004 ft.

NEW IBERIA—IBERIA PARISH

I. Delcambre's No. 1 Vintar, 150 ft. E, 150 ft. S and 150 ft. W of SE cor. of tract, Sec. 41-12s-5e.
Fishing 245 ft.
Harrison & Abercrombie's No. 2 Schwing, beginning at E cor. of Sec. 24-12s-8w, thence southwesterly along section line 3,054 ft., thence NW at R/A 1,121 ft.
Drlg. shale 2,640 ft.
Y. D. Spell's No. 2 Sabiater, 1,200 ft. N and 28 ft. W of E line, Sec. 54-12s-7e, 150 ft. N of discovery well.
Abd. 3,895 ft.

IOWA—CALCASIEU AND JEFF DAVIS PARISHES

Magnolia Pet. Co.'s No. 10 Walt, 330 ft. N and E of SW cor. of lease.
Drlg. sticky shale 6,560 ft.
Shell Pet. Corp.'s No. 13 Hyde, 330 ft. W, 330 ft. S of NE cor. NW Sec. 13-9s-7w.
Derrick.
Shell Pet. Corp.'s No. 11 Hyde, 330 ft. E and S of NW cor. NE Sec. 13-9s-7w.
Location.
Shell Pet. Corp.'s No. 5 Stratford, 1,994 ft. S, 330 ft. E of NW cor. of Sec. 18.
T.D. 6,909 ft.; to sidetrack.
Shell Pet. Corp.'s No. 10 Hyde.
Drlg. shale 1,980 ft.
Shell Pet. Corp.'s No. 3 Tuten, 1,159 ft. W and 330 ft. from S of NE cor. SE Sec. 13-9s-6w.
Drlg. shale and lime 6,461 ft.

JENNINGS—ACADIA PARISH

Port City Oil Co.'s No. 14 Jennings Haywood, 150 ft. N and 25 ft. W of No. 12.
T.D. 1,723 ft.; I.P. 85 bbls. per day; comp.
Yount Lee Oil Co.'s No. 14 Housierre-Latrielle, 260 ft. N of No. 13, Sec. 47-9s-2w.
Drlg. sand 6,289 ft.

LAKE BARRE—TERREBONNE PARISH

Texas Co.'s No. 11 L.L.&E., Sec. 30-21s-20e.
Drlg. anhydrite 3,309 ft.
Texas Co.'s No. 12 L.L.&E.
Drlg. sandy shale 4,115 ft.

LAKE HERMITAGE—PLAQUEMINES PARISH

Humble O. & R. Co.'s No. 2 LaFourche Basin Levee Dist.
Drlg. shale 5,284 ft.

LAKE PELTO—TERREBONNE PARISH

Whitstone O. & G. Co.'s No. 1 Buckley, 300 ft. S and E of NW cor. SW SW Sec. 15-19s-16e.
T.D. 3,053 ft.; tested gas on a D.S. test; prepare to set csg.

LAKE WASHINGTON—PLAQUEMINES PARISH

Humble O. & R. Co.'s No. 23 Cockrell-Moran, 650 ft. N and 21 deg. 30 min. E of No. 2 in Twp. 20s-26e.
Drlg. shaley sand 3,810 ft.

LEESVILLE—LAFOURCHE PARISH

Emerald Pet. Co.'s No. 7 State of Louisiana.
Drlg. 1,560 ft.
Gulf Prod. Co.'s No. 10 Bernard, 1,833 ft. E, 958 ft. S of NW cor. Sec. 26-21s-22e.
Derrick.
Gulf Prod. Co.'s No. 2 Community, 50 ft. W and 1,300 ft. E of NW cor. Sec. 26-21s-22e.
Derrick.
Gulf Prod. Co.'s No. 8 Bernard, 568 ft. E along S line of 5.08-ac. tract from SW cor. and 446 ft. N at right angles, Sec. 26-21s-22e
Drlg. sand 1,802 ft.
Emerald Pet. Co.'s No. 8 State of La., 455 ft. N of No. 1
7⅝-in. csg.; T.D. 3,723 ft.
Emerald Pet. Co.'s No. 10 State, west bank 300 ft. S of well No. 1.
Location.
Emerald Pet. Co.'s No. 11 State, east bank. 227 ft. N of well No. 1.
Location.
Emerald Pet. Co.'s No. 12 State, east bank. 250 ft. S of well No. 1.
Location.
Frank L. Hill's No. 1 Bernard, 1,422 ft. N and 808 ft. E of SW cor. Sec. 26-21s-22e S.D. 2,670 ft.
Leesville Oil & Gas Co.'s No. 1 Southern Louisiana Canal Navigation Co., 35 ft. W of Bank of Bayou, 15 ft. N of S bank, Sec. 26-21s-22e.
S.D. 4,189 ft.
Texas Co.'s No. 21 L.L.&E., Sec. 26-21s-22e.
Drlg. sand 4,055 ft.
Texas Co.'s No. 28 L.L.&E.
Drlg. 3,574 ft.

LOCKPORT—CALCASIEU PARISH

Magnolia Pet. Co.'s No. 13 Bordages, 968 ft. W and 92 ft. N of SE cor. N½ NE Sec. 8-10s-19w
Running tubing 6,558 ft.
Union Sulphur Co.'s No. 1 Moss (W.O.).
Drlg. shale and lime 4,035 ft.

PORT BARRE—ST. LANDRY PARISH

Gulf Prod. Co.'s No. 8 Wilson Cochran, 568 ft. E along S line of L. Bernard 5.08-acre tract from SW cor. of Sur., 466 ft. N at right angles to said line, being 400 ft. N of line drawn through No. 1 and No. 3, Sec. 26-22s-12e.
Drlg. sand and lime 3,666 ft.

ROANOKE—JEFFERSON DAVIS PARISH

Humble O. & R. Co.'s No. 1 Taylor, 440 ft. E and 440 ft. S of NW cor. SW Sec. 12-9s-4w.
Rig up.
Humble O. & R. Co.'s No. 1 R. C. Jarnegan, 440 ft. S, 440 ft. E of the NW cor. SE Sec. 12-9s-4w.
Rig up.
Humble O. & R. Co.'s No. 3 Devilbiss, 1,-399 ft. W, 466 ft. S of NE cor. Sec. 14-9s-4w.
T.D. 8,746 ft.; P.B. from 8,441 ft. to 8,-351 ft.
Shell Pet. Corp.'s No. 1 Jarnigan, 330 ft E, 660 ft. S, NW cor. Sec. 13-9s-4w.
Drlg. shale 8,973 ft.

SORRENTO—ASCENSION PARISH

Union Sulphur Co.'s No. 28 United Land
Drlg. hard shale and lime 5,577 ft.

SULPHUR—CALCASIEU PARISH

Union Sulphur Co.'s No. 790 fee, 929 ft. S and 802 ft. W of C Sec. 29-9s-10w.
Milling out 4,197 ft.
Union Sulphur Co.'s No. 795 fee.
Swabbing 5,506 ft.
Union Sulphur Co.'s No. 800 fee.
Drlg. shale and boulders 1,625 ft.
Union Sulphur's No. 2 Uldrick, 500 ft. N of No. 1.
Drlg. shale 1,293 ft.
Union Sulphur's No. 803 fee.
Drlg. shale and lime 2,389 ft.
Union Sulphur Co.'s No. 2 Kelly, 1,345 ft. S, 198 ft. W of the NE cor. of Sec. 30-9s-10w.
Drlg. hard shale 5,622 ft.

SWEET LAKE—CAMERON PARISH

Pure Oil Co.'s No. 12 Yount Lee fee, 300 ft. S of No. 11, in line with Nos. 9 and 10. Sec. 12-13-3w.
S.D. 7,439 ft.

VINTON—CALCASIEU PARISH

Marrs McLean's No. 15 F. H. Gray, 342 ft. N and 338 ft. E of SW cor. Sec. 33-10s-12w.
Drlg. sand 2,240 ft.
Vinton Oil Co.'s No. 1 J. G. Gray, 230 ft. from N line and 545 ft. from E line of SE NE Sec. 4-11s-12w.
T.D. 3,730 ft.; prepare to P.B.
Wilson Broach's No. 7 Wilson (W.O.), Sec. 33-10s-12w.
Coring shale 3,575 ft.

WHITE CASTLE—IBERVILLE PARISH

Shell Pet. Corp.'s No. 9 Wilburn, 300 ft. E of No. 7.
T.D. 7,517 ft.; to sidetrack.

MISCELLANEOUS WILDCATS
TEXAS
ANGELINA COUNTY

Thayer et al's No. 1 Dearmond, J. T. Peavy Sur., 2¼ miles SE of Zavalla.
Hard lime 1,915 ft.; T.D.

AUSTIN COUNTY

J. S. Wheeless et al's No. 1 Lewis Wittenburg, 330 ft. S and 1,100 ft. from W line of 202.5-ac. tract, Sec. 179, H.&T.C. Sur.
Prepare to drill plug 492 ft.

BRAZORIA COUNTY

Amerada Pet. Corp.'s No. 1 Houston Farm Dev. Co., 1,414 ft. N, 316 ft. W of SE cor. of L. Bachelder Sur.
Fishing 7,663 ft.
Harrison & Abercrombie's No. 1 Bernard River Land, 1,000 ft. out of SE cor. of Lot 23.
7-in. at 8,606 ft.; flowing 12 bbls. per hr.; 70% wash wtr., 30% oil; T.D. 8,651 ft.
C.&R.G. Drlg. Co.'s No. 1 Frank Trukasa, 200 ft. from S and 1,000 ft. from E lines of 75-ac tract. Sec. 7, H.T.&B.R.R. Sur.
S.D. 7,890 ft.
Holt et al's No. 1 Griffith, J. B. Bailey Sur
T.D. 4,200 ft.; waiting orders.
McCarthy Oil Co.'s No. 1 National Life Insurance Co., 800 ft. S of N line of Blk. 3 and 466 ft. E of W line of E½ of H. Austin League No. 4.
S.D. 6,536 ft.
Stanolind Oil & Gas Co.'s No. 1 J. W. Surface, 466 ft. N and 400 ft. W of most easterly SE cor. of 75.9-acre tract, A.C.H. &B. Sur., Abstr. 462.
Drlg. shale 1,825 ft.
Turnbull & Irwin's No. 1 Sutherland & Buck, 330 ft. from N and S lines and 150 ft. from W line of 40-ac. tract, A. Robinson Sur.
Drlg. shale 2,722 ft.

CALHOUN COUNTY

Continental Oil Co.'s No. 1 American Nat. Realty Co., C of NE of Sec. 6, Blk. C. Temp. S.D. 7,119 ft.
Steen Drlg. Co.'s No. 1 Stanzel, 500 ft. along N line from NW cor., thence 350 ft. at R/A of 371.2-ac. tract, A. E. Parsa Sur
S.D. for further orders 6,145 ft.

CHAMBERS COUNTY

Humble O. & R. Co.'s No. 1 Middleton, 466 ft. each way out of the SW cor. of survey. Location.
Sun Oil Co.'s No. 1 Hamilton 1,400 ft. from N line, 1,400 ft. from W line of survey. T.&N.O. Sur., Sec. 128.
Drlg. sand 2,305 ft.

COLORADO COUNTY

Coyle-Concord Oil Co.'s No. 1 Nelson, 3,200 ft. SE of NW cor. of Sec. 2,200 ft. SW at right angles in I.&G.N. Sur.
S.D. 6,194 ft.

FORT BEND COUNTY

Benedum & Trees' No. 1 Jacob Hensler, Charles D. Sayers Sur.
S.D. 15 ft.; waiting on csg.
W. A. Shafer et al's No. 1 V. B. Bortash, 693 ft. SW of NE line and 1,003 ft. NW of SE line of Sec. 52, H.&T.C. Sur.
S.D. 2,900 ft.
Vico Oil Co.'s No. 1 H. R. Darst, 5,690 ft. N of S line and 685 ft. W of E line of E. Powell Sur.
Drlg. shale 3,950 ft.
Wilks et al's No. 1 Norris, 300 ft. W and 1,352 ft. S of N cor. of 525-acre tract (5 miles S of Needville).
Abd. 30 ft.

GALVESTON COUNTY

Gillock Pet. Co.'s No. 2 Maco Stewart, 900 ft. N and 150 ft. W of No. 1, Alex Farmer Sur.
T.D. 1,500 ft.; waiting on surface pipe; S.D.
H. E. Sedberry, trustee's No. 1 Thomas Shaw (200 acres), 150 ft. NW line, 165 ft. NE line, Lot 66, Sec. 7, Hall & Jones, Galveston Island.
S.D. 53 ft.
Humble O. & R. Co.'s No. 1-B Stewart, 415 ft. S of Dickinson Bayou, 460 ft. E of E line of Blk. 16, Beatty Subd., John Sellers Sur.
Washing well; T.D. 8,035 ft.
Pure Oil Co.'s No. 1 J. W. Sheler (281.2 acres), 3,760 ft. S of Dickinson-San Leon highway and midway E and W lines of lease, B.B.B.&C. Sur.
Drlg. shale 7,616 ft.

GRIMES COUNTY

Hubert Holt et al's No. 1 Simon Fuqua, 1,200 ft. N of S line and 400 ft. W of E line of 177-ac. lease and survey, Moses Evans Sur.
No report.
Dr. Marshall et al's No. 1-B Todd, 300 ft. from E line and 175 ft. from N line of 150-ac. tract in extreme NW cor. of county (25 ft. N of No. 1).
S.D. 1,305 ft.

HARDIN COUNTY

Kirby Pet. Co.'s No. 1 Southwest Settlement & Development Co., 1,450 ft. W of E line and 330 ft. S of N line of Sec. 226, H.&T. C. Sur.
Drlg. shale 3,452 ft.

HARRIS COUNTY

American Liberty Oil Co.'s No. 1 Sweeney, Sec. 17, W.C.R.R. Sur.
Drlg. shale 6,578 ft.
C. B. Bunte, Inc.'s No. 1 Laura Lackner, 6,400 ft. from E line, 194 ft. from S line of Henry Reinerman Sur., near NW city limits of Houston.
Drlg. shale, strips of sand 7,664 ft.
C. C. Foster and others' No. 1 H. K. Johnson, 2,000 ft. from S line and center of E and W lines of G.C.&S.F. Sur.
Drilled 25 ft. and S.D.
Farrell Bros. Co.'s No. 1 Brooks Est., 7,400 ft. S and W of NE cor. of R. & R. Vinor Sur.
Abd. 412 ft.
W. U. Paul's No. 1 E. M. House, 2,200 ft. N and 1,000 ft. E of NE cor. of E. Benson Sur. in M. Magruder Sur.
S.D. 4,122 ft.

JACKSON COUNTY

Atkins & O'Neil's No. 1 Hodges, C Sec. 22, Blk. 1, I.&G.N. Sur.
Location.
Humble O. & R. Co.'s No. 1 Lowrance, 660 ft. from SW and SE lines of Wilson Sur. No. 5.
Drlg. shale 3,532 ft.

JEFFERSON COUNTY

Magnolia Pet. Co.'s No. 1 E. Herbert Trust, 990 ft. N, 330 ft. E of SW cor. of P. M. Bell Sur. No. 2.
Drlg. shale 9,042 ft.
Sun Oil Co.'s No. 1 H. Long, 1,500 ft. E line, 990 ft. E line of lease.
Drlg. shale 5,262 ft.

LIBERTY COUNTY

R. M. Bruner et al's No. 1 N. Bell, 150 ft. from N line and 150 ft. from W line of Bell's 187-ac. tract, H.&T.B. Sur. No. 4.
Rigging up.
Extension Oil Co.'s No. 1 J. A. Lovett, 280 ft. from E and 600 ft. from S line of lease, P. P. Devers Sur.
S.D. 3,593 ft.
Liberty-Independent Oil Co.'s No. 1 J. M. Neal, 3,550 varas from E line and 500 varas from N line of Samuel Strong Sur.
D.S. stuck; T.D. 3,130 ft.
A. L. Maxwell's No. 1 M. D. Hinchliff, 300 ft. from E line and 1,000 ft. from N line of H.&T.C. Sur. No. 150.
Location.
Thomas et al's No. 1-A Ricke, 660 ft. from W line and 2,350 ft. from S line of tract in Green Sur.
T.D. 5,047 ft.; 6⅝-in. csg. at 5,029 ft.
Turnbull and Irwin's No. 1 Lynott and Buffum, 466 ft. S and E of NW cor. of 52 100 acres of W 400 acres of 356-ac. tract. James Robeson Sur.
Coring shale 7,216 ft.
Sunray Oil Co.'s No. 1 Ferguson, 1,000 ft. S and 750 ft. E of SE cor. of Francis Fulcher Sur.
Moving in material.

MATAGORDA COUNTY

Continental Oil Co.'s No. 1 Robbins, J. G. Frass Sur.
T.D. 6,995 ft.; S.D. 6,625 ft.
Dr. Griffith's No. 1 fee, 1,000 ft. from E

line and 3,000 ft. from W line of Wm. B Bell Sur.
Rig up and S.D.

MONTGOMERY COUNTY

Reynolds Drlg. Co. et al's No. 1 Mrs. Clara B. Stewart, 330 ft. S and E of most easterly inner cor. of 595-ac. tract, John Corner Sur.
Moving in material.

ORANGE COUNTY

Sinc Line Oil Co.'s No. 1 Godwin, Richard Ballew Sur., 300 ft. from E line and 150 ft. from NE line of Godwin 20-ac. tract.
S.D. 2,703 ft.

POLK COUNTY

Howard Dailey et al's No. 1 Z. B. Knox, 1,450 ft. W and 1,920 ft. S of NE cor. of F. Chairs Sur., 1½ miles NE of Corrigan.
S.D. 60 ft.

J. F. Anderson's No. 1 R. L. Duke (O.W.D. D.), 400 ft. from E and 350 ft. from S of SW cor. of P. Michelick 50-ac. lease, Abst. 56, P. J. Mineral Sur.
Waiting on a new mud pump; T. D. 5,-884 ft.

Dick Schwab's No. 1 Lynch, 330 ft. out of NW cor. of 200-ac. tract in the George Jameson Sur.
Location.

REFUGIO COUNTY

Cecil Hagen et al's No. 1 Edith Clarkson, 1,786 ft. from N line, 3,820 ft. from E line of J. Coughlin Sur.
Location.

Dale Sneed's No. 1 Peck, 366 ft. N and W out of NW and SW of Bonnie View Subd. T.D. 5,800 ft.; tested 450 lbs. pressure in 3 min.

Quintana Oil Co.'s No. 3-A O'Connor, 396 ft. from SW line, 1,107 ft. from SE line of Swisher Sur.
Location.

VICTORIA COUNTY

Devonian Oil Co.'s No. 1 J. M. Fagan, Peter Teal League, Abst. 112, 9,000 ft. from N line, 466 ft. W of E line.
Coring shale 5,903 ft.

Texas Co.'s No. 1 E. B. Potthast, N 50 deg. E. 850 ft. S, 35 deg. E. 850 ft. from W cor. of lease, T.&N.O.R.R. Sur., Sec. 11.
Coring sand 2,960 ft.

WALKER COUNTY

S. P. Kilgore et al's No. 1 Lamkin, 330 ft. from S line and 330 ft. from E line of Lamkin 1,000-acre tract in J. J. Holcomb Sur.
Drlg. sandy shale 3,345 ft.

WALLER COUNTY

Stanolind O. & G. Co. et al's No. 1 J. W. Tharp, 466 ft. from S and E lines of J. M. Bennett Sur. No. 100.
Location.

WHARTON COUNTY

Whitehead and Rash's No. 1 C. T. and D. Kountze, 1,320 ft. from N line, 330 ft. from E line of S.A.&M.G. Sur., Sec. 1, Abst. 328.
Location.

SOUTH LOUISIANA

ACADIA PARISH

Humble O. & R. Co.'s No. 1 American Rice Mills, 660 ft. S and 1,320 ft. W from NE cor. Sec. 27-10s-1e.
Bldg. rig.

ALLEN PARISH

Humble O. & R. Co.'s No. 1 Industrial Lumber Co., 1,320 ft. W line and 2,440 ft. S line Sec. 21-3s-5w.
Drlg. shale 5,050 ft.

ASCENSION PARISH

Humble O. & R. Co.'s No. 2 S. Gumbel & Co., 500 ft. southwesterly from No. 1, 275 ft. easterly from road and approx. 475 ft. N of S line of tract, Sec. 33-10s-2e.
Drlg. sand 1,450 ft.

BEAUREGARD PARISH

Gulf Ref. Co.'s No. 1 Lutcher Moore, 660 ft. from S line, 760 ft. from E line, NE Sec. 25-6s-12w.
Drlg. hard shale 7,063 ft.

Richardson & Martin's No. 1 Southwest Lbr. Co., SW Sec. 6-8s-13w.
Location.

CALCASIEU PARISH

Fohs' No. 1 O. H. Castle, 330 ft. S and 330 ft. W of C Sec. 18-9s-3w.
Location.

Humble O. & R. Co.'s No. 1-B Industrial Lbr. Co., 466 ft. N, 1,399 ft. W of the SE cor. Sec. 27-8s-12w.
Drlg. shale 3,560 ft.

Union Sulphur Oil Co.'s No. 1 State Land, 1,940 ft. S, 2,513 ft. E of NW cor. Sec. 13-9s-8w.
Drlg. sticky shale 6,148 ft.

Wheeler Oil Co.'s No. 1 Gabbert, 1,322 ft. E and 548 ft. N of SW cor. of Sec. 22-9s-7w.
Drlg. gumbo 2,316 ft.

EAST FELICIANA PARISH

Thompson Creek Oil Co.'s No. 1 Fannie Noland, 2,600 ft. E and 1,580 ft. N of SW cor. Sec. 70.
Drlg. gumbo 1,127 ft.

EVANGELINE PARISH

Humble O. & R. Co.'s No. 1 Haas, 1,250 ft. SE of Bayou Nespique, 466 ft. NE of SW line of Sec. 22-4s-1w.
Drlg. shale 3,450 ft.

CAMERON PARISH

Texas Co.'s No. 10-A State, 16,865 ft. W and 3,270 ft. N of NE cor. Sec. 1-14-9w in Twp. 13s-9w.
T.D. 6,270 ft.; drlg. shale and lime 5,-984 ft.

Texas Co.'s No. 1 Jensen, 1,170 ft. E and 550 ft. N of C Sec. 24-14s-10w.
Rig up.

JEFFERSON DAVIS PARISH

George W. Strake's No. 1 Calcasieu Natl. Bank, 200 ft. S and E of NW cor. SE NE Sec. 12-9s-6w.
Spudded.

LAFOURCHE PARISH

Barnsdall Oil Co.'s No. 3 Harang Plantation. Sidetracked hole 5,285 ft.; drlg. 5,690 ft.

S. L. Gay trustee's No. 1 Godchaux, 4,920 ft. N and 1,746 ft. E in common cor. of Lots 24 and 26, Twp. 15s-19e.
S.D. 6,236 ft.

Southern Sulphur Corp.'s No. 1 D. L. Lagraize, 300 ft. E of NW cor. of Lot 7, thence 250 ft. S of Sec. 26-21s-22e.
Spudded and S.D.

PLAQUEMINES PARISH

Texas Co.'s No. 12 State-Garden Island Bay, Sec. 107-23s-32e.
Set 21¼-in. csg. at 102 ft.; to D.D.; T.D. 1,748 ft.

Venice Corp.'s No. 1 Burras.
Drlg. lime rock 1,535 ft.

RAPIDES PARISH

J. B. Evers' No. 1 G. Wettermark, 540 ft. S and 530 ft. E, NW cor. NE SW Sec. 31-4n-3e.
Location.

C. D. Loe's No. 1 Barrett, 330 ft. NW of SE line and 330 ft. NE of SW line of Sec. 40-5n-1w.
Rig up and S.D.

ST. BERNARD PARISH

Danciger's No. 1 Battles, 836 ft. N, 2,193 ft. W of SE cor. Sec. 135-14s-14e.
Drlg. lime 5,531 ft.

ST. LANDRY PARISH

Bailey Gaunce's No. 1 Lewis, 300 ft. N and E of SW cor. of NW of NE of Sec. 29-5s-6e (workover).
Reaming to bottom 5,043 ft.

H. J. Weir's No. 1 Declouet, Sec. 108-8s-5e, near Lafayette Parish line and 3 miles N of Anse La Butte Field.
Drlg. gumbo 2,640 ft.

ST. MARTIN PARISH

Texas Co.'s No. 6 St. Martin Land Co., 660 ft. S and 500 ft. W of NE cor. SE Sec. 17-8s-7.
Drlg. sandy shale 9,505 ft.

VERMILLION PARISH

Moore Bros.' No. 1 Brussard, 350 ft. S of N line, 350 ft. E of W line, NE cor. Sec. 32-11s-3e.
T.D. 4,056 ft.; fishing.

La.-Ark. Wildcats

(Continued from Page 151)

George Le Grande's No. 1 Vance, 180 ft. N and W SE cor. SW Sec. 34-12-16.
S.D. for csg. 3,030 ft.

Ben F. Smith's No. 1 Bonds, 200 ft. E, 500 ft. N, SW cor. Sec. 33-12-11.
S.D. for wtr. 1,210 ft.

W. K. Williams' No. 1 Wemple, 600 ft. N, 330 ft. W, SE cor. Sec. 16-12-11.
W.O.S.R. 2,734 ft.

EAST CARROLL PARISH

Holcomb & Thomason's No. 1 Milliken, 198 ft. N, 1,340 ft. E of C Sec. 22-23-13e.
Dry and abd. 3,505 ft.

LA SALLE PARISH

F. A. Trichelio's No. 1 Urania, Sec. 3-3-1e.
Rigging up.

MOREHOUSE PARISH

Southern Carbon Co.'s No. 65 fee, 2,030 ft. S, 600 ft. E NW cor. Sec. 14-20-4e.
Set 6-in. 2,115 ft.

Zeiger & Bacon's No. 1 Crossett, 400 ft. N, 300 ft. W, SE cor. Sec. 41-23-4e.
T.A. 3,111 ft.

NATCHITOCHES PARISH

Benedum & Trees' No. 1 Carrier Est., 300 ft. N and W, SE cor. Sec. 6-8-7.
Drlg. 3,750 ft.

Clyde Crichton's No. 1 Friedman Est., 496 ft. N, 420 ft. E, SW cor. Sec. 52-7-8.
S.D. for wtr., 1,085 ft.

Jack Lent's No. 1 Brown Lbr. Co., 400 ft. S, 300 ft. E, NW cor. NE SW Sec. 27-9-12.
P.B. to 2,470 ft.

Missouri Drlg. Co.'s No. 1 Brown Lbr. Co., 400 ft. N, 330 ft. W, SE cor. Sec. 5-10-10.
S.D. 1,033 ft.

Roy A. Raines et al's No. 1 Raines est., 330 ft. N and E, SW cor. Sec. 8-9-10.
S.D. for water 2,606 ft.

OUACHITA PARISH

Hamilton Gas Co.'s No. 1 Parker, 557 ft. S, 473 ft. W, NE cor. Sec. 2-19-3e.
Drlg. 540 ft.

James A. Noe's No. 1 Wall, 184 ft. S, 1,-872 ft. E of C Sec. 25-19-3e.
Drlg. 490 ft.

RAPIDES PARISH

Evars & Collingsworth's No. 1 Hickman, 330 ft. S and E, NW cor. Sec. 40-4-1e.
Dry and abd. 2,130 ft.

C. D. Loe, trustee's No. 1 Baird Est., SE cor. Sec. 40-5n-1w.
Rigging up.

RED RIVER PARISH

Louis L. Glass' No. 1 Dickson, 400 ft. S and W, NE cor. SE Sec. 32-12-9.
S.D. 1,030 ft.

C. M. Cope et al's No. 1 Thomas, 330 ft. S and E, C Sec. 34-13-3.
S.D.; W.O. 2,405 ft.

Windsor Oil Co.'s No. 2 Jenkins, 1,980 ft. S and E, NW cor. Sec. 14-12-11.
Drlg. 500 ft.

SABINE PARISH

H. J. Brothers et al's No. 1 Edwards, 300 ft. S. and W. NE cor. SW NW Sec. 29-9-13.
Set 6-in. 1,552 ft.

R. B. Campbell et al's No. 1 Cook Land Co., 150 ft. N, 300 ft. W, SE cor. NW NW Sec. 35-10-12.
Tested dry after acid; S.D.; W.O. 1,935 ft.

Erle P. Halliburton's No. 3 Burkett, 330 ft. N and W, SE cor. SW SE Sec. 9-9-13.
W.O.S.R. 2,010 ft.

Halliburton & Meadows' No. 1 Jackson, 330 ft. S and E, NW cor. NE NE Sec. 15-9-13.
Dry and abd. 1,650 ft.; old T.D. 1,998 ft.

Helena O. & G. Co.'s No. 2 Heard, 330 ft. S and E, NW cor. NW NE Sec. 16-9-13.
Set 10-in. 45 ft.; drlg. 1,512 ft.

Helena Oil & Gas Co.'s No. 1-B Graham, 330 ft. S and W NE cor. NE NW Sec. 20-9-13.
Pumping S.W. 2,000 ft.

L. D. Higgins' No. 2 Burkett, 330 ft. S and E, NW cor. NE NE Sec. 16-9-13.
W.O.S.R. 2,035 ft.

Lawson-Leavell's No. 1 Whitney Corp., 330 ft. N and E, SW cor. NE SW Sec. 5-9-13.
Set 8-in. 1,514 ft.; testing 1,605 ft.

Zan Lloyd's No. 1 Henderson, 330 ft. N and W, C Sec. 29-9-13.
W.O.S.R. 2,031 ft.

Dr. O. B. Hicks' No. 1 Neal, SE SW SE Sec. 18-9-13.
Set 10-in. 40 ft.

TENSAS PARISH

Schumacher, tr.'s No. 1 Curry, Sec. 39-11-12e.
Arranging to deepen 3,750 ft.

UNION PARISH

Carbons Consolidated's No. 1 Lankford, 431 ft. N, 382 ft. E, SW cor. SE SE Sec. 3-21-3e.
Comp.; 1,500,000 ft. of gas 2,200 ft.

ARKANSAS

ARKANSAS COUNTY

Grand Prairie Realty Co.'s No. 1 Fischer, 200 ft. S and E, NW cor. NE NW Sec. 6-6s-4w.
Drlg. 450 ft.

COLUMBIA COUNTY

Dudney & Woodward's No. 1 Pearce, 330 ft. S and W, NE cor. NW Sec. 7-17-20.
Drlg. 2,160 ft.

HEMPSTEAD COUNTY

Ark. Drlg. Co.'s No. 1 Jones, 1,000 ft. S, 600 ft. W, NE SE Sec. 11-14-24.
Reaming to bottom 2,808 ft.

B. A. Austin's No. 1 McWilliams, 300 ft. N and W of SE cor. NW SW Sec. 19-13-28.
S.D. for wtr. 2,000 ft.

A. H. Bagnelle's No. 1 Trattner & Rhinehart, Sec. 2-13-26.
S.D. 1,992 ft.

F. W. Martin & Co.'s No. 1 Lafferty, 500 ft. N and W SE cor. NW Sec. 17-14-24.
Repair derrick; 3,760 ft.

LAFAYETTE COUNTY

Benedum & Trees' No. 2 Bodcaw, C SE SE NE Sec. 19-16-23.
Drlg. 4,196 ft.

Douglas Lawn's No. 1 Camp, 330 ft. S and W, NE cor. SW SE Sec. 14-15-23.
S.D. 2,910 ft.

W. H. Harvey's No. 2 Allen, Sec. 13-19-24.
Rigging up.

A. H. Tarver's No. 1 Russell, 330 ft. S and W, NE cor. NW Sec. 12-17-25.
Rigging up.

MILLER COUNTY

Duluth-Ark. Oil Co.'s No. 4 Beck, SE cor. SE SW Sec. 34-15-26.
Drlg. 1,250 ft.

Fitzwater et al's No. 1 Norson, SW cor. SE SW Sec. 20-15-27.
S.D. 2,177 ft.

Ark. Oil, Gas & Ref. Co.'s No. 1 Beck, SW cor. NW SW Sec. 34-15-26.
1,200 ft. oil in hole at 2,920 ft.

King Oil Corp.'s No. 1 C. H. Schroder, 200 ft. N, 330 ft. E, SW cor. SW NE Sec. 24-14-28.
Coring 2,810 ft.

Magnolia Pet. Co.'s No. 5 Olivet, Sec. 3-16-26.
Testing 2,940 ft.

A. C. Roan's No. 1 Frost Est., 150 ft. N and W, SE cor. SE SW Sec. 8-15-26.
Rigging up.

Lee Timberlake's No. 1 Frost Est., 330 ft. N and E, SW cor. SW SE Sec. 27-15-26.
Set 10-in. 200 ft.

NEVADA COUNTY

O. F. Whittaker's No. 1 Wesley, Sec. 3-15-20.
Drlg. 1,520 ft.

OUACHITA COUNTY

F. A. Book et al's No. 1 Arnold, Sec. 34-15-16.
S.D. 2,032 ft.

T. J. Gaughan's No. 1 Bragg, 330 ft. N and E, SW cor. NE SE.
Set 10-in. 104 ft.

UNION COUNTY

Jovian Oil Corp.'s No. 1 Perdue, 150 ft. N, 650 ft. E, SW cor. NW SE Sec. 3-17-14.
Moving in rig.

Mrs. R. K. Jones et al's No. 1 J. Davis, 330 ft. N and W, SE cor. NW NW Sec. 28-16-14.
Fishing for csg. 2,764 ft.

Lion Oil Ref. Co.'s No. 10-A Flenniken, 200 ft. N, 630 ft. E. C Sec. 10-16-15.
Recmtd. 8 3/16-in. csg. 2,496 ft.

McCrosleen Oil Co.'s No. 1 Union Saw Mill Co., 330 ft. N and W, SE cor. NE NW Sec. 3-18-13.
Comp.; pumping 25 bbls., 3,577 ft.

Reuter Oil Co., Inc.'s No. 1 J. L. Kinard, 330 ft. S and E, NW cor. SE NW Sec. 32-18-14.
S.D.; W.O. 2,189 ft.

Short & Hayes' No. 1 Taylor, 450 ft. E, 330 ft. S, NW cor. NW SE Sec. 10-17-14.
Set 6-in. 3,326 ft.; T.D. 3,366 ft.

Tubal Pet. Co.'s No. 1 Gaddy, 340 ft. N and E, SW cor. SE NW Sec. 14-17-14.
S.D.; W.O. 2,416 ft.

WOODRUFF COUNTY

L. P. Lively's No. 1 Perkins, 330 ft. N, 360 ft. E, SW cor. SE SE Sec. 5-5n-2w.
Rigging up.

J. N. Watkins et al's No. 1 Upshaw, 330 ft. N and E, SW cor. NW SW Sec. 17-5n-2w.
Rigging up.

MISSISSIPPI

AMITE COUNTY

Mineral Resources, Inc.'s No. 1 Anderson, C NE NW Sec. 14-3n-3e.
S.D. 550 ft.

BOLIVAR COUNTY

White & Jones' No. 1 Ballou, SE SE NW Sec. 17-24n-7w.
S.D. 20 ft.

GREENE COUNTY

United Gas Pub. Service Co.'s No. 1 Greene County School Land, W½ W½ Sec. 16-1n-5w.
Drlg. 2,850 ft.

HARRISON COUNTY

Big Ridge Oil Co.'s No. 1 Hinzin, NE Sec. 13-7s-10w.
Drlg. 925 ft.

ISSEQUENA COUNTY

Pelican Oil & Gasoline Co.'s No. 1 Martin & Bender, 300 ft. S and E, NW cor. Sec. 11-13n-8w.
Set 10-in. 200 ft.

JONES COUNTY

Snow-Black Pet. Co.'s No. 2 Watson, 330 ft. W, 300 ft. S, C Sec. 24-7n-13w.
T.A. 3,900 ft.

LAUDERDALE COUNTY

Bob Dalton's No. 1 Bounds, Sec. 34-7n-15e.
Set 10-in. 560 ft.; S.D.; W.O.

MONROE COUNTY

P. J. McAlpine's No. 1 Frank Rye, Sec. 11-15s-17w.
Drlg. 2,000 ft.

P. J. McAlpine's No. 1 Crook, 1,090 ft. S, 90 ft. W, NE cor. Sec. 15-13s-13w.
Set 8-in. 730 ft.

SIMPSON COUNTY

Berry Corp.'s No. 2 R. T. Berry, Sec. 13-2n-4e.
Set 7-in. 2,048 ft.

WALTHALL COUNTY

Mutual O. & G. Co.'s No. 1 Boyd, SW cor. SW SE Sec. 24-2n-9e.
Partly rigged up and S.D.

WARREN COUNTY

Orbet Drlg. Co.'s No. 1 R. L. Parker, 300 ft. E, CWL Sec. 14-14-1e.
Dry and abd. 3,252 ft.

WASHINGTON COUNTY

Perkins & Dees' No. 1 Lee, 1,500 ft. E, 660 ft. N, SW cor. Sec. 33-15n-4w.
Set 10-in. 300 ft. and S.D.

WINSTON COUNTY

Jack Vale et al's No. 1 Moody, 713 ft. N, 667 ft. E, SW cor. NW SW Sec. 3-13n-14e.
S.D. 20 ft.

La.-Ark. Proven Fields

NORTH LOUISIANA

CADDO—BLANCHARD

C. W. Brown et al's No. 1 Sharf, 1,650 ft. S, 350 ft. W, NE cor. Sec. 10-18-16.
Comp.; 1,500,000 ft. of gas at 940 ft.

Louana-Pyramid's No. 1-A Wheeler, 660 ft. S and W of C Sec. 4-18-16.
8-in. csg. 20 ft.

M. Segal's No. 2 Sharf, 330 ft. S and W. NE cor. NW NW Sec. 11-18-16.
Coring 932 ft.

CADDO—HOSSTON

Shoreline Oil Corp.'s No. 44 Crystal, 330 ft. S and E of C Sec. 13-21-16.
Derrick (corrected).

SABINE PARISH—ZWOLLE

Alexander & Cane's No. 1 Fogman, SE cor. N½ SW NE Sec. 18-7-11.
Arranging set csg. 2,353 ft.

Ivan A. Allen's No. 1 La. Long Leaf, 330 ft. N and W, SE cor. NW SE Sec. 12-7-11.
S.D. for wtr. 2,120 ft.

Crichton & Co.'s No. 1 Williams, 660 ft. N and E, SW cor. SW SE Sec. 6-7-11.
Set 6-in. 2,345 ft.

Dyer et al's No. 1 McCollister, 330 ft. S and E, NW cor. SW NE Sec. 24-7-12.
S.D. 1,100 ft.

Foster & Hartman's No. 1 Bowman Hicks, 330 ft. S and E, NW cor. NE Sec. 10-7-12.
S.D.; W.O. 2,696 ft.

E. D. Holcomb's No. 1 Porter, 330 ft. S, 330 ft. W, NE cor. SE Sec. 7-7-11.
Pulling liner 2,580 ft.

H. C. Maulding's No. 1 Davis, 350 ft. N and W, SE cor. NE NE Sec. 2-7-11.
Rigging up.

H. C. Maulding's No. 2 DeLatin, 330 ft. S and E, NW cor. NE SE Sec. 3-7-11.
S.D. 2,250 ft.

Pelican Nat. Gas Co.'s No. 36 La. Long Leaf, 1,320 ft. N, 2,540 ft. E, SW cor. Sec. 9-7-11.
Used acid 2,796 ft.

Pelican Nat. Gas Co.'s No. 37 La. Long Leaf, 100 ft. S and E, NW cor. SE SE Sec. 8-7-11.
Rigging up.

K. C. Peterson et al's No. 1 Bowman-Hicks, 330 ft. S and E, NW cor. SW NW Sec. 2-7-9.
Rigging up.

Texas Co.'s No. 1 H. E. Wilson, 330 ft. S and W NE cor. SE SE Sec. 31-8-11.
Testing 2,489 ft.

Tex.-La.-Ark. Oil Co.'s No. 1 Pickering Lbr. Co., Sec. 3-3-12.
Arranging to resume drlg. at 2,210 ft.

EAST TEXAS (BORDER COUNTIES)

CASS COUNTY

R. K. Kamon et al's No. 1 Savage, Mary Patterson Sur.
S.D. 4,016 ft.

HARRISON COUNTY

W. T. Boyd's No. 1 Rudd, John McWilliams Sur.
Rigging up.

R. C. Payne et al's No. 1 Lowery, E. D. Spain Sur.
P.B. to 3,524 ft.

PANOLA COUNTY

R. H. Davis' No. 1 Wooten Est., Winnie Mann Sur.
S.D. 2,692 ft.

Givens & Holloway's No. 1 Wooten est., Winnie Mann Sur.
S.D. 2,153 ft.

R. W. Price's No. 1 Crawford, J. A. Williams Sur.
Rigged up and S.D.

Fred Stovall Drlg. Co.'s No. 1 H. B. Ivey, P. Martin H.R.S.
S.D. for csg. 1,980 ft.

SHELBY COUNTY

Bush Oil Int.'s No. 1 Windham, W. M. Blackburn Sur.
Abd. 2,366 ft.

Cliff Stovall's No. 1 Pickering Lbr. Co., C H. Patterson Sur.
S.D. 690 ft.

Turner & Neil's No. 1 Pickering Lbr. Co., P. W. Harvey Sur.
S.D. 250 ft.

ALABAMA

HOUSTON COUNTY

Rice O. & G. Co.'s No. 1 Oakley est., NE cor. NW SW Sec. 9-3n-29e.
S.D. 2,410 ft.

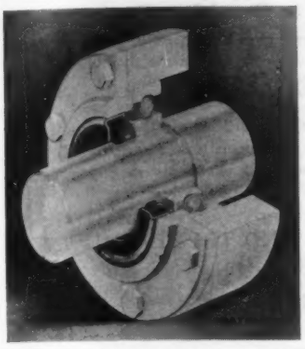
LAMAR COUNTY

DeSoto O. & G. Corp.'s No. 1 Gardner, Sec. 32-15s-16w.
S.D. 4,183 ft.

NEW AND IMPROVED EQUIPMENT

Garlock Klozure Offered As An Effectual Oil Seal

The Garlock Klozure, a new oil seal developed by the Garlock Packing Co., Palmyra, N. Y., is offered as an effectual device for retaining oil and grease



within a bearing and keeping dust and dirt out. The company's engineering department gave exhaustive study and experimentation to the problem of making a really dependable oil seal, and the Klozure is the result. This seal has just four parts, the adapter, the spreader, the sealing member, and the case.

The adapter is a metal ring flanged to contact the spreader. It bears against the body of the packing ring, holding it firmly in place in the case and preventing leakage between the outside diameter of the packing ring and the case. It exerts constant pressure upon the spreader.

The spreader is a flexible metal ring with saw-toothed edges formed into a V shape to fit into the convex face of the sealing ring. The angle of the V in the spreader is broader than the angle of the sealing ring; therefore, when the seal is assembled and the spreader brought into contact with the sealing ring its saw-toothed edges bear upon the lip of the sealing ring causing it to hug the shaft in leakproof contact. The function of the spreader is merely to supplement the inherent resiliency of the packing ring itself.

The sealing or packing member, the most vital part of the device, uses a composition ring, made of material having the characteristics necessary to withstand oil-seal service. This material is dense and grainless, nonporous, resilient, oil-resistant, heat-resistant, nonabrasive, tough and durable, and has a low coefficient of friction.

The cases are made in hardened steel dies to exact specified sizes. Unless otherwise ordered cases are made of steel.

NEW HUMIDITY CONTROLLER

Operating executives in plants or buildings having humidifying or air-conditioning equipment should be interested in the claims made by the Foxboro Co. of Foxboro, Mass., for its newly developed Rotax indicating relative humidity controller. It is said that the accuracy of Foxboro's membrane type humidity recorder is combined in this instrument with the Rotax type contacts to form an electrically operated humidity controller that will give accurate control throughout its entire life. Neither of these units is a new development. The combination, however, is new and makes available several features not obtainable previously in humidity controllers. The controller can be located conveniently wherever electric current is available. It maintains humidity simply and easily by operating solenoid valves and motor valves on water, air or steam lines.

Among the Equipment Houses

The district office of the development and research department of the International Nickel Co., Inc., has moved into larger quarters in the General Motors Building, Detroit, Mich.

—

The new $7,000,000 plant of the Mathieson Alkali Works, Lake Charles, La., will begin operations early in December. Construction work at the new plant is being maintained considerably ahead of schedule, despite the fact that it involves a number of engineering developments embodied in such a plant for the first time.

—

F. R. Kohnstamm has been appointed manager of the lighting division of the Westinghouse Electric & Manufacturing Co.

—

The Link-Belt Co., Chicago, has purchased the physical assets of the Bailey-Burruss Manufacturing Co., Atlanta, Ga. All divisions of Link-Belt's Atlanta sales office, moved to the Bailey-Burruss plant, will henceforth be known as the Atlanta plant of Link-Belt Co.

—

J. H. Richardson, 1906 West McKinney Avenue, Houston, Tex., has been appointed representative in South Texas and South Louisiana of the Koalt Engineering Co., Tulsa.

—

The Henry J. Linn Co., 250 Stuart Street, Boston, Mass., has been appointed New England sales agent for the Globe Steel Tubes Co., manufacturer of seamless steel tubular products, including mechanical tubing, boiler tubes, condenser tubes and stainless steel tubing.

—

Charles E. Stuart has resigned as president and treasurer of the Tyson Roller Bearing Corp., Massillon, Ohio. He will remain on the board of directors. Russell E. Colgate, chairman of the board, has been elected president and treasurer succeeding Mr. Stuart.

—

The Struthers-Wells Co., Warren, Pa., has appointed W. V. C. Jackson district sales representative in Oklahoma, Kansas and eastern Texas, with offices in the National Bank of Tulsa Building, Tulsa. Mr. Jackson was formerly with the A. O. Smith Corp. in this same territory.

—

The Continental Can Co., Inc., will erect a three-story addition to its plant in Houston, Tex., giving it a completely integrated can manufacturing unit at Houston for the manufacture of cans for oil, paint, chemicals and other products.

—

At a meeting of the board of directors of the Timken Roller Bearing Co., L. M. Klinedinst was elected to the board and also to the office of vice president in charge of sales to fill the vacancy created by the recent resignation of Judd W. Spray. Mr. Spray plans to spend the winter in Florida.

Men Well Known in the Equipment Field

DON C. DAVIS

Don C. Davis has been appointed manager of derrick sales for the Emsco Derrick & Equipment Co. in Oklahoma, Kansas and West Texas with headquarters in the Continental Building, Dallas, Tex. Mr. Davis has been connected with Emsco for the last six years. Formerly he held the position of district manager for one of the major derrick manufacturers and before that was manager of the material department of one of the large oil companies.

Leakage and Waste of Air Avoided by Murdock Valve

The Murdock Q. O. C. air valve, announced by the Murdock Manufacturing & Supply Co., 426 Plum Street, Cincinnati, Ohio, neither leaks nor wastes air, according to the manufacturer. In a reported test under 100 pounds pressure one of these valves was still tight after being opened and closed 30,000 times at a rate of 40 full operations a minute. The valve is designed for use in refineries, portable air-compressors, engine houses and almost anywhere compressed air is employed. It is said to be of particular usefulness in cleaning flues and tubes in refineries. If a cutter breaks, the valve shuts off before any damage can be done.

This air valve, the manufacturer says, cannot be left partly open, because the instant the cam is turned past center the pressure and spring positively close the valve. It is closed and held tight by pressure. The spring is an auxiliary in case the valve is installed in horizontal or diagonal positions. The valve cannot be forced or jammed at the seat, because the instant it is down on the seat the cam is disengaged, idle. The up-down action eliminates friction at seat. No regrinding is necessary.

The gland or stuffing box can be repacked without taking the valve from the line or shutting off the air.

The Murdock Q. A. steam valve, which may be used for air and oils also, is similar to the Q. O. C. in design and in advantages. Neither the Q. O. C. nor the Q. A. is recommended for water because of its quick closing and possible shock to the pipe line.

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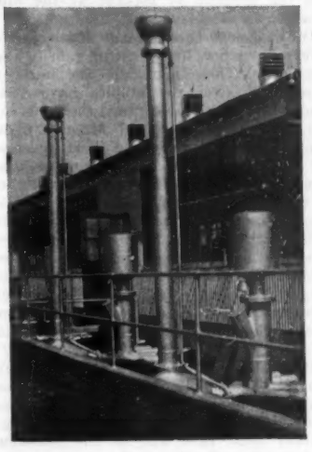
The S. M. Jones Co., Toledo, Ohio, is sending to those who ask for it a bulletin on Jones sucker rods.

Removes Large Volume of Dirt Without Restriction

The illustration shows large 24-inch Vortox air cleaners connected to the air intakes of Cooper-Bessemer Type 80, four-cycle natural gas engines operated by the United Gas Public Service Co. in its compressor station at Iowa, La. The cleaners shown are the Type F Vortox units, equipped with bottom outlets, particularly suited for installations outside



of buildings. This installation was made by manifolding the two air intakes into one common 10-inch standard pipe extending in a vertical position and supporting the air cleaner.

The picture shows the backfire relief valve inserted in the air line between the cleaner and the engine to prevent damage to the cleaner in case of intake explosions or backfires.

The Vortox Manufacturing Co. builds its large cleaners with both top outlets and bottom outlets, in capacities ranging from 1,000 to 5,000 cubic feet per minute, the largest sizes being approximately 65 inches high and 45 inches in diameter.

The upper part of the air cleaner is filled with a double crimped wire in long strands, which serves as a filter element. Below the filter is the centrifugal chamber, the bottom of the cleaner providing the oil reservoir. The air enters the cleaner at a tangent to the side, causing the air to whirl. Centrifugal action picks up the oil like a waterspout, and sprays it in fine particles throughout the chamber. Approximately 90 per cent of the dirt is washed out of the air, settling in the bottom of the cleaner, where it is easily removed. Continuous circulation of oil in the filter element keeps this part thoroughly washed and prevents clogging, so that the larger types of cleaners, similar to those shown in the photograph, will handle up to 150 pounds of dirt without any increase in restriction.

Vortox air cleaners are recommended for use on all types of internal combustion engines and air compressors. They are distributed in the Gulf Coast territory by the Portable Rig Co., Inc., of Houston, Dallas and Longview, Tex., and in the Mid-Continent area by the Waukesha Motor Co.

—

"Meet the Rockmaster" is the title of a bulletin issued by the Worthington Pump & Machinery Corp., Harrison, N. J., describing a drilling device for down-hole, line, hillside, breast-hole, side-hole and snake-hole drilling in many types of structural work.

Oil Suction and Discharge Hose for Tankers Designed

Hose designed specifically for loading and unloading oil tankers has been in use for many years. Since it undergoes abrasion from contact with docks and the decks of boats, exposure to oil and grease, and prolonged immersion in water and mud, a great deal of effort has been expended to develop a product which would meet in a satisfactory manner these severe conditions.

Users of this type of hose had long been pointing out that the nipple was the weakest link in the proverbial chain; and one of them compiled data to prove that three-quarters of suction hose failures were caused by defective nipples. They were justly rigid in their requirements on this point, because leakage of oil or gasoline constitutes a serious fire hazard. Technologists have therefore realized that their efforts to develop a satisfactory hose would be in vain unless the problem of leakage at the nipples were solved.

Oil discharge hose is made of successive layers of rubber, heavy cotton fabric, and steel wire. These materials are built on a mandrel after the nipples have been placed in position so that the ends of the hose are constructed directly upon the nipples. Formerly the most successful practice in the attachment of nipples was by means of clamps bolted tightly on the outside of the hose. In addition to the clamps, heavy-gauge wire was wound on spirally under high pressure after the hose had been vulcanized, to reenforce the end of the hose around the nipple. As vulcanized rubber does not flow, nor is it easily deformed under stress, the nipples are held firmly in place.

But there were practical objections to clamps. They not only made the hose clumsy to handle, but injured the decks and equipment of the boats. More important than this, due to the presence of free oil and other inflammable materials on and about tankers and refinery docks, they were quite as great a fire risk as the leaky nipples because of their tendency to strike sparks in contact with metal fixtures.

These objections to clamps led to the adoption of the clampless nipple. The method of manufacturing oil hose with this type of attachment differs from that employed in the case of clamp nipples in two ways. (1) During the process of building the layers or plies of unvulcanized rubber and fabric impregnated with rubber, the nipple binding wire is spiraled into the structure under high tension instead of being wound externally. By this means the plies of the hose carcass are compressed tightly. (2) This tension is applied before vulcanization instead of after, as was the practice with clamp nipples.

Nevertheless, in spite of the carcass of the hose being wound against the nipple, the high temperature necessary for vulcanization causes the plies of rubber to soften and flow before actual vulcanization begins. This is characteristic of rubber and cannot be avoided. This loosening of the structure during vulcanization is a vital defect of the clampless nipple, and in service oil often seeps between the plies of fabric and through the end of the hose around the nipple.

A new clampless nipple has recently been developed by the Boston Woven Hose & Rubber Co., Cambridge, Mass., which combines the advantages of the two types of attachment just described and overcomes their disadvantages. This nipple is so constructed that the loosening effect of vulcanization on the hose carcass is later compensated by expanding internally the nipple itself to a corresponding degree. (U. S. Patent No. 1,970,513, issued August 14, 1934. Patents pending in foreign countries.)

This new improved nipple is made of special seamless steel pipe, which can be expanded after the hose is vulcanized. The length of the nipple is about 2 feet. In its central portion are two annular bulges or rings, 6 inches apart, also of seamless steel, which are welded to the body of the nipple and project approximately one-quarter of an inch. These rings are overlaid with three plies of high grade rubber. After the hose is vulcanized, the 6-inch section of the nipple between the rings is expanded, and the tendency to loss of pressure previously encountered with the clampless nipple is thus overcome. By this means the nipple is not only vulcanized into the hose but locked in. The metal and rubber rings, or dams, make this device still more effective by acting as shoulders which prevent the nipple from blowing off.

Hose equipped with this expansion-type nipple easily withstands a test pressure of 250 pounds per square inch. It is doubtful whether in the face of this requirement any manufacturer could guarantee leakless hose with the older clampless nipple. With the new nipples there is no leakage, and if the pressure is increased to the bursting point of the hose, around 1,100 pounds per square inch, the nipples remain intact, and the hose ruptures in the carcass.

Browning Heads Sales of the S. M. Jones Co.

The S. M. Jones Co., Toledo, Ohio, manufacturer of sucker rods, announces the appointment of H. K. Browning as manager of sales. Mr. Browning was

H. K. BROWNING

formerly with A. M. Byers Co., manufacturer of wrought iron products. He started with the company in 1925 as sales engineer, first in Chicago and later in Kansas City. In 1926 he was made Kansas City district manager and the following year was made division manager for both the St. Louis and Kansas City districts. In 1930 he was transferred to San Francisco, Calif., to take over the entire West Coast activities of the Byers company.

In 1932 the Byers company reorganized its sales to the petroleum industry on a national scale and Mr. Browning was moved ot Pittsburgh, Pa., as manager of oil sales. He held that position up to the time of his recent appointment as sales manager for the S. M. Jones Co.

DISK-TYPE ELECTRIC BRAKE

A compact, smooth-acting, disk-type electric brake, designed for mounting directly on a number of types of G-E motors, has been announced as an addition to the line of solenoid and thrustor-operated brakes manufactured by the General Electric Co. The new brake is intended especially for controlling small hoists, cranes, winches and similar equipment. It is suitable for applications requiring no more than 50 pounds-feet braking torque on a continuous basis, or 75 pounds-feet on an intermittent basis. The brake is obtainable, completely mounted and wired, as a shipped-assembled unit on G-E ball-bearing squirrel-cage, wound-rotor, or single-phase and direct-current motors in the NEMA frames.

METER PERFORMS TWO DUTIES

A new meter to indicate and record both boiler water level and feed-water flow has been developed by the Bailey Meter Co., Cleveland, Ohio, for use in boiler plants where it is desired to have both an indication and record of these factors on the operating floor.

This combination meter consists of a standard Bailey fluid meter which indicates, records and integrates feed-water flow and a 12-inch indicator with a dial type scale for boiler water level. The indicator is mounted directly above the recording meter on a small feed water panel. If desired, this combination meter can be located on the individual boiler control panel.

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